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The manifestation of mindfulness and the pragmatic use of social
and material resources in problem-solving: The case study of
junior doctors in NHS England.

By

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Dedication

I dedicate this work to my deceased mother, who always prayed and wished for me to achieve excellence in my endeavour. This thesis is the first step towards that.

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Declaration

I declare that this is entirely my work and has not been submitted as a part of any other university degree.

ABSTRACT

Problem-solving is a critical component of professional practice, particularly in the novel and complex situations that call for rapid decision making. However, although emphasising their importance in professional practice, the literature provides a limited understanding of maintaining mindfulness and the use of social and material resources in the problem-solving process amid an activity, particularly in healthcare. This study, aiming to explore the problem-solving process amid an activity, explores how junior doctors in NHS (United Kingdom) hospital settings recognise and solve problems by maintaining mindfulness and using contextual resources (social and material resources) to achieve specific objectives.

The aim of the study and the main features of problem-solving (problem-solving process, problem recognition and problem-solving in achieving specific outcomes), direct this research to explore three questions: 1) How is mindfulness and information processing manifested in the situated processes of junior doctors' problem recognition during their everyday work? 2) How do junior doctors decide when and why to use social and material resources in the midst of their problem-solving process? 3) How do junior doctors work with social and material resources amid their problem-solving process? To explore the questions above, I used and leveraged data from the shadowing (45-days), artefacts (300 reflective logs, online databases) and interviewing (n=22) of junior doctors, conducted as part of this study. The rich data and analysis offered a number of contributions.

First, this study contributes by showing how junior doctors (novice professionals) remain mindful of bodily actions, professional knowledge, tools and technology, while at the same time processing acquired information in defining problems in a distinct way; i.e., bodily actions capture clues that enable the recall of related knowledge and are subsequently organised to capture all related clues and information. Furthermore, junior doctors interpret clues and information that can be based on intuitive and analytical reasoning as defined in the dual process theory of information during problem recognition. I reveal that contextual complexities and clues if captured effectively through actions and body sensory clues (listening, smelling, feeling, touch etc.), facilitate cognition during the problem-solving process, contrary to findings from recent research.

Second, the findings offer a novel insight into the process of employing social and material resources for problem-solving. My study shows that social and material resources are equally important and reveals explicitly when and why social or material resources are used. The study establishes that material resources are used when the problem is sophisticatedly defined (articulated in medical professional language) during the problem-solving process, while social resources are employed when the problem is crudely defined during the problem-solving.

Finally, the study shows that that effective use of social resources during problem-solving is dependent on the assessment of expertise and availability of the person consulted. This advances our understanding by showing that this aspect of problem-solving also relies on the willingness of a specific person to help in a given time and space. The study has several practical implications in minimising error in medical decisions making and improving the learning of junior doctors, which are also specified.

1 CHAPTER 1: INTRODUCTION

1.1 Motivation and rationale of the study

Providing a high-quality healthcare service to the general population is mainly dependent on the medical professionals', and specifically the junior doctors' ability to solve the problems during patient management (Norman et al., 2017; Jippes et al., 2010; Epstein, 2008; Boonyasai et al., 2007). In particular, authors have emphasised that it is critically important for junior doctors to learn how to constantly adapt in line with increasing scientific and technological advances, in order to minimise the mistakes during problem-solving and to improve the safety of health delivery (Walsh, 2014; Neale, Vincent and Darzi, 2007). This emphasis is consistent with the growing understanding that competent medical professionals double their knowledge base every five years, yet 85% of this knowledge is going to be obsolete within 15 years (Robinson, 1993). It is therefore important that junior doctors learn to become self-learners in problem-solving (Gonnering, 2010; GMC, 2013). In addition, doctors' learning and development are embedded in their engagement with experience and practice (Nicolini, 2013; Tsoukas, 2009; Gherardi, 2007; Engeström, Miettinen and Punamäki, 1999; Lave and Wenger, 1991). Thus, as junior doctors move from being trainees to become competent professionals, they must become masters of their learning from experience, in order to solve problems and practice safely. The challenge of making professionals self-learner can be achieved by developing junior doctors' skills to make them capable of identifying problems, reflecting, and then modifying their course of action in the midst of it, in order to solve the problem (Yanow and Tsoukas, 2009).

Problem-solving is one of the most critical skills for doctors because it enables them to provide safe and effective healthcare, specifically during diagnostic decision-making. Diagnostic decision-making involves acquiring information from across the entire clinical context, making judgements about the cause of the patient's problem and deciding upon an action plan for treatment (Weiss, 2011). Over the past thirty years, the literature on problem-solving and decision-making has mainly focussed on three cognitive approaches (Bruner, 1987; Hammond, 1990; Mok & Stevens, 2005;

Norman et al., 2017; Quirk, 2006). First, in the analytical model, medical diagnosis is understood as a logical, step-by-step cognitive process of acquiring information, hypothesis building and interpretation. Second, in the intuitive model, medical diagnosis mainly relies on pattern recognition or a rapid/unconscious understanding of the current situation by relating it to previous similar experience (Croskerry, 2009a; Kahneman et al., 1982; Quirk, 2006). Finally, the dual process theory argues that both processes, analytical and intuitive reasoning, work simultaneously in diagnostic decision-making (Bruner, 1987; Eva, 2004; Norman, 2009). In these models, professional knowledge and cognitive capacity are central to making an effective diagnosis (Berg, 1997).

The cognitive approaches have made an invaluable contribution by exploring the processes and mechanisms involved in error-free diagnosing (Mamede et al., 2014; Norman et al., 2017). Experts estimate that 75% of the diagnostic errors are the result of practitioners' cognitive failure (Graber, Franklin and Gordon, 2005). Such cognitive failure instils errors in hypothesis building, the interpretation of clues, and sustained biases in intuitive interpretation and decision-making (Epstein and Hundert, 2002; Graber, Gordon and Franklin, 2002). Graber (2005), for instance, examined the causes of problem-solving and decision-making failure in an extensive five-year long empirical study and found that errors in problem-solving are due to four main causes, namely: faulty knowledge, faulty data gathering, faulty information processing and faulty verification.

However, practice-based studies (MacIntyre, 1985; Nicolini, 2013; Schatzki, 2001; Wenger, 1998) and a few recent empirical studies in the field of healthcare, suggest that actions and context influence the cognitive process during problem-solving (Croskerry, 2009b; Durning et al., 2011; McBee et al., 2015). Consequently, empirical investigation into how problem-solving can be facilitated by the context, knowledge and actions of junior doctors is almost non-existent (Eva, Link, Lutfey, and McKinlay, 2010; Lutfey and McKinlay, 2009). Hence, in order to contribute towards filling this research gap, this thesis aims to explore essential aspects of junior doctors' practice that facilitate the process of problem recognition and help such doctors solve them amid practice.

1.2 Theoretical underpinnings and gaps

Due to the limitations noted above, the information processing and the decision-making approach have been criticised for not capturing the complexities of problem-solving processing in a real work setting (McBee et al., 2015; Norman et al., 2017). The naturalist model, in turn, focuses on the dynamic and changing nature of decision-making during problem-solving in a real work setting. There are several modes of naturalist decision-making styles, but for this study, I discussed and used recognition-primed decision (RPD). RPD has received much broader acceptance within and from researchers and practitioners (Klein, 1998; Klein, 2017). According to RPD, the decision maker contiguously assesses the situation and takes skilled actions at every opportunity to lead them towards the desired objective to solve the problem in hand. These skilled actions are usually based on the knowledge gained by practitioners through their experience of the repertoire of patterns (Klein, Calderwood and Clinton-Cirocco, 1986; Klein, 1998). Thus, RPD suggests two significant aspects of decision-making besides cognition, namely situational awareness and knowledge in order to facilitate actions in problem-solving. In the endeavour to achieve the aim of the study, I thus also suggest that problem-solving comprises of two main aspects, namely problem recognition and problem-solving (Yanow and Tsoukas, 2009).

First, recognising the problem, as something set apart from existing insights and experiences, occurs in the midst of activity (Yanow and Tsoukas, 2009). It could be related to a lack of knowledge, information or interpretation of information in making conclusions (Klein, 1998). Problem recognition is here mainly based on the ability of professionals to capture situated clues and information in a given context and interpret them as being problematic (Dewey, 1933; Yanow and Tsoukas, 2009). The recruitment of situated clues and information requires organised and skilful bodily action that can only be developed by making focused efforts as part of '*participating*' in practice itself (MacIntyre, 1985, p. 187; Nicolini, 2013; Schatzki, 2001; Wenger, 1998). Further, in the organisational setting, the activities of professionals are messy and complex (Nicolini, 2013; Schatzki, 2001; Engeström, 2000), making it continually challenging to record relevant information and clues. Notably, this is particularly the case for novices, like junior doctors (Brooks, LeBlanc and Norman, 2000). Accordingly, the literature suggests that the process of defining the problem

cannot be taken as being spontaneous or automatic for the novice (Yanow and Tsoukas, 2009).

Drawing on literature, I concur that problem recognition requires a focus on a number of factors, such as specific mindfulness for remaining attentive to the details (Epstein, 1999; Yanow and Tsoukas, 2009), specific actions to capture clues and contextual information, and interpreting information to articulate a situation as problematic (Brown and Ryan, 2003; Schön, 1983; Norman et al., 2009; O'Neill et al., 2005). Mindfulness is also required to capture contextual information and subtle clues (Epstein, 1999; Giluk, 2009; Weick and Sutcliffe, 2006; Langer and Moldoveanu, 2000). The concept of reflecting in the midst of action to solve the problem accentuates the importance of body and responses to actions when handling pressing situations (Dewey, 1933; Schön, 1983). In this approach, the body plays a vital role in gaining situational awareness. We must therefore also consider the embodied knowledge that is vested in the body and demonstrated as a skilled movement (Blackler, 1995).

Furthermore, in order to interpret situated clues and information as problematic or insufficient for addressing the issue at hand, novice professionals such as junior doctors require the ability to process the information effectively (Norman, 2009; Hedberg and Larsson, 2003). The interpretation of a situation as problematic is essential for doctors because problems in action that go unnoticed result in adverse outcomes and mistakes in healthcare. For instance, recent healthcare reports (Elliott et al., 2018; Health and Safety Executive, 2010) estimated that almost 66 million potentially clinically significant errors occur per year, and most of them are avoidable.

However, despite the definitions and theoretical explanations such as those described above, and Weick's (2011) observation that mindfulness is a continuous process of accomplishment of everyday work, we still know little about how junior doctors operationally achieve mindfulness in a way that enables them to capture the related information and clues in the problem recognition process. The empirical investigations into healthcare mostly explore how mindfulness may influence stress reduction, well-being, burnout, emotional exhaustion etc. (Shapiro, Brown and Biegel, 2007; Jain et al., 2007; Galantino et al., 2005). The empirical investigations,

however, remain scarce on how mindfulness is actively achieved by junior doctors during the problem-recognition process in hospital settings. Therefore, the first arising question this study explores in the empirical context of the everyday work of junior doctors in hospital settings is *1) How is mindfulness and information processing manifested in the situated processes of junior doctors' problem recognition during their everyday work?*

Second, another aspect of problem-solving explored by this study looks at how junior doctors develop relevant knowledge to enable them to solve the problem in the midst of activity. For this objective, this dissertation focuses on the processes of knowledge sharing (Gabbay and Le May, 2004; Casebeer et al., 2002; Ferlie et al., 2013; Wenger, 1998), as it is recognised that for novice or junior doctors, the problem may emerge due to their lack of knowledge and skills (Plant et al., 2017). In other words, this existing work suggests that an empirical focus on how a junior doctor may develop the required knowledge or modify existing knowledge to *solve a problem* in the midst of the action is likely to make a valuable contribution.

Drawing on literatures on social learning (e.g., Wenger, 1998), and knowledge-sharing mechanisms in healthcare (Gabbay and Le May, 2004; Ferlie, Crilly, Jashapara and Peckham, 2012), we can suggest that a novice can develop requisite knowledge by using social and material resources (people, paper, electronics) as sources of information and knowledge during problem-solving. In the context of this research, *material resources* denote 'guidelines', books, protocols, policy information in paper or electronic form, while *social resources* refer to the members of that community of practice (Wenger, 1998). Importantly, this builds on existing findings in the health sector about the use of social and material resources in problem-solving (Gabbay and Le May, 2004; Casebeer et al., 2002; Cogdill et al., 2000). Specifically, some suggest that material resources (online databases and guidelines) are helpful sources in problem-solving, while others show that doctors rarely use material resources but mainly draw on social resources in actual practice (Gabbay and Le May, 2004). Thus, there is value in further empirically investigating why and when social and material resources are productively used by junior doctors to build their necessary knowledge for problem-solving. Hence, the second question of this explorative study

is 2) *How do junior doctors decide when and why to use social and material resources in the midst of their problem-solving process?*

Finally, the distribution of knowledge and information across organisational resources (social and material), and their availability in relation to their contribution to solving the problem are not homogenous within organisational settings (Nicolini, 2013; Wenger, 1998). Specifically, Dopson and Fitzgerald (2005) argue that the decision and choice to use information and knowledge-seeking mechanisms is not straightforward in healthcare. The junior doctors may need to be selective in choosing specific sources of information to solve the given problem (Ferlie et al., 2012; Gabbay and Le May, 2004; Huber, 1991). It is, therefore, important to explore whether junior doctors may be more effective in deciding on specific social resources when they retrospectively make sense (Sandberg and Tsoukas, 2015; Weick, 1995) during problem-solving. However, at present, we have little empirical evidence that shows how they do so in practice, primarily as relatively novice doctors. Hence, the final research question of this study is 3) *How do junior doctors work with social and material resources in the midst of their problem-solving process?*

In summary, this study endeavours to explore how junior doctors' actions, contextual resources and thinking facilitate problem recognition and solving of problems in the midst of practice. Three research questions guide the study:

1. How is mindfulness and information processing manifested in the situated processes of junior doctors' problem recognition during their everyday work?
2. How do junior doctors decide when and why to use social and material resources in the midst of their problem-solving process?
3. How do junior doctors work with social and material resources in the midst of their problem-solving process?

1.3 Research design

In light of the research questions and the theoretical underpinnings identified, the thesis engaged the practice lens and "the framework of practical rationality"

(Sandberg and Tsoukas, 2011, p. 342) as a guide to empirically and analytically capturing the practice of junior doctors. In particular, I worked to understand the actions and processes of junior doctors that make them mindful as “rich awareness of discriminatory detail” coupled with a “capacity for action” to collect information and clues (Epstein, 1999; Weick and Sutcliffe, 2006). Also, I wanted to understand how they make sense and draw knowledge from social and material resources in order to solve the arising problems in their daily work, i.e., in hospital settings (Nicolini, 2013). For this purpose, I engaged and interacted with potential participants in a UK NHS hospital for eight months (March 2014 to October 2014) to establish familiarity with the participants and context. It also helped me in developing a rapport with participants to minimise observer’s effect (Lincoln and Guba, 1985). Hereafter, I started an ethnographic study over ten months (from October 2014 to August 2015) of 24 participant junior doctors to capture rich data (McDonald, 2005; McDonald and Simpson, 2014). In order to ensure the robustness of my analysis, I engaged data from shadowing (24 junior doctors for 45 days), artefacts (over 300 reflective logs, online databases) and interviewing (n=22) junior doctors in two departments of an NHS England trust hospital, namely, Acute Medicine and Accident and Emergency (McDonald and Simpson, 2014).

First, I focused on junior doctors’ daily activities and how they carry them out. Here, the role of body and tools in accomplishing everyday activity became particularly prominent. In particular, focusing on bodily actions surfaced the role of artefacts and technology, interactions between junior doctors and other healthcare professionals, the purpose and nature of the interactions (face to face, telephone etc.) and the content of the discussions (talking about the medication, critical conditions, blood reports, signs and symptoms of disease, etc.). These analytical foci are common to the practice lens (Nicolini, 2013), namely interactions, talk, materiality, and negotiated meaning.

Second, to capture junior doctors’ thinking during the problem recognition and problem-solving activities, I conducted ethnographic interviews at the same time to ‘articulat[e] their stream of consciousness’, their thoughts, feelings and emotions while they actually go about the activity being studied” (Burgoyne and Hodgson, 1984: 163). For this, I specifically asked questions to explore junior doctors’

responses to 1) thwarted expectations, i.e. when action was disturbed due to unanticipated outcomes and/or standards of excellence were not met; 2) the emergence of deviation, e.g., when a new discourse was introduced, or new actions appeared, and 3) operations being temporarily disturbed as the practitioner realised a new way of doing (Sandberg and Tsoukas, 2011). These events were clear signposts of problems in an activity of the junior doctor. This focused data collection strategy elicited data mainly related to the phenomenon of problem recognition and problem-solving. I also used the “think aloud” technique to capture routine thinking during an activity (McDonald and Simpson, 2014).

Furthermore, I captured the content and purposes of interactions by doctors with other healthcare professional and technological resources to precisely understand how they learned problem-solving in the midst of an activity. All this data was presented via a rich description (Denzin, 1989) of junior doctors’ everyday work. Its analysis importantly enabled me to contribute to knowledge in distinct ways, as detailed below.

1.4 Contributions to knowledge

My multimodal empirical analysis mainly drew on the literature on mindfulness, information processing in *problem recognition* and knowledge-sharing mechanisms to *solve problems*. The empirical analysis enabled me to outline a grounded conceptualisation of how junior doctors realise problem-solving in practice. Specifically, there have been recent and notable calls to explore this in particularly rich empirical settings, to improve our understanding of how we can develop the skills and knowledge of junior doctors to *recognise problems and solve* them during their activities (Hammond, 1990; Mok & Stevens, 2005; Norman et al., 2017; Quirk, 2006; Yanow and Tsoukas, 2009; Dopson and Fitzgerald, 2005). This study contributes to the empirical gap; i.e., by exploring how problems are solved in the everyday work of junior doctors and have the following theoretical and practical implications.

Theoretically, the thesis offers novel insights into the problem-solving. First, understanding the process of realising the problem in the midst of doctors’ action. In this aspect, I engaged the concepts of mindfulness (Epstein, 1999; Weick, 2011),

information processing, and decision-making (Norman et al., 2009; O'Neill et al., 2005) to make sense of the empirical findings. Importantly, this study contributes by showing how junior doctors (novice professionals) remain mindful of bodily actions, professional knowledge, tools and technology and at the same time process acquired information in defining problems in a distinct way; i.e., bodily actions capture clues that enable the recall of related knowledge and are subsequently organised to capture all related clues and information. Further, junior doctors interpret clues and information that can be based on intuitive and analytical reasoning as defined in the dual process theory of information (Croskerry, 2009a; Norman et al., 2009; O'Neill et al., 2005) during problem recognition. The study reveals that contextual complexities and clues if captured effectively through actions and body sensory clues (listening, smelling, feeling, touch etc.), facilitate the cognitive process during problem-solving, contrary to findings from recent research (Durning et al., 2011; McBee et al., 2015). These findings contribute to the literature on mindfulness (Epstein, 1999; Weick, 2011) and information processing (Croskerry, 2009b; Durning et al., 2011; McBee et al., 2015; Norman et al., 2009) by elucidating the active process of maintaining mindfulness and processing information during problem recognition, as indicated above.

Second, the study contributes to our understanding of how useful knowledge is drawn from different social and material resources in organisational settings (Nicolini, 2011; Lave and Wenger, 1991; Wenger, 1998) to solve the problem at hand. The study aligns with the practice-based approach, which suggests that our interactions with such resources are directed by activity (e.g., Nicolini, 2011). The findings offer a novel insight into the process of employing social and material resources for problem-solving (Gabbay and Le May, 2004). In particular, Gabbay and Le May (2004) contend that “clinicians rarely accessed, appraised, and used explicit evidence directly from research or other formal sources” (p. 3) and “practitioners nearly always took shortcuts to acquire what they thought would be the best evidence base from sources that they trusted” (P.3). These sources include the “popular doctors and nurses” (p. 3); i.e., they rarely use material resources (databases, guidelines, protocols etc.) in problem-solving and mostly rely on socially constructed ‘mindlines’”. My study shows that material resources are equally important (Casebeer et al., 2002), especially

when the problem is sophisticatedly defined (articulated in medical professional language) during the problem-solving process.

Furthermore, Gabbay and Le May (2004) suggest that the selection of social resources in problem-solving is chiefly based on “the trust in ‘their’ expertise” like “the popular doctors and nurses” (p. 3); i.e., previously held knowledge about the expertise of colleagues and other healthcare professionals working in the vicinity. This study complements the work of Borgatti and Cross (2003) and demonstrates that active information seeking is dependent on both the expertise *and* availability of a person. It advances our knowledge by showing that the processes of utilising social and material resources in problem-solving also rely on the willingness of a specific person to help in a given time and space.

The study offers practical suggestions for healthcare policymakers, trainers and doctors. First, the theoretical understanding of the manifestation of mindfulness and social and material interactions during the problem-solving process can minimise the major error-causing factors such as faulty knowledge, lack of information, wrong information and wrong interpretation (Graber, 2005). Second, I provide nuanced empirical detail on how junior doctors can recognise a problem in their actions, such as a lack of information, misinterpretations or a lack of knowledge so that they can focus on developing those skills and learn in problem-solving.

Finally, trainee doctors in the UK are already using prescribed reflective logs, which are guided by specific questions. Drawing on my findings, I suggest some updated questions for the reflective logs, which can generally be used by all doctors, but which would be of particular use to junior doctors. The guiding questions are tailored in a way that may facilitate junior doctors to capture the complexities of the problem-solving process and represent learning in reflective logs. It brings added richness to their written reflection. Doctors are also able to focus on skills the study identified as highly relevant (i.e., capturing tacit clues, effective information acquisition and interpretation, timely seeking of help, effectively selecting sources who can help), in developing the expertise of problem recognition and solving in the midst of practice.

Furthermore, the suggested reflective log questions are intended to motivate the doctors to consider how they identify the knowledge gap or problem and subsequently how they solve the problem with the help of social and material resources. It overcomes the limitations of the existing reflective logs, specifically with regard to recent developments, when doctors suspect that these reflective logs can be used as evidence against them in a criminal court (Launer, 2018; Furmedge, 2016). The questions suggested in this study focus the doctors' attention on problem-solving as achievements in learning, which leads to more open behaviour. Junior doctors are expected to be more open because the doctors can describe how they manage problems and minimise the potential errors in the flux of activities, as opposed to merely reporting their errors. In summary, the proposed activities and processes integrate learning, both epistemological and ontological (Reynolds and Vince, 2007; Clegg, Kornberger, and Rhodes, 2005; Tsoukas, 2005; Vince, 2001) that a junior doctor requires for developing problem-recognition and problem-solving capabilities.

1.5 Structure of the thesis

In the following Chapter 2, I begin by critically reviewing the existing literature related to the phenomenon of problem-solving. The Chapter identifies the critical components of problem-solving. Such as, how professionals define the problem, understand the context to converse with and interpret the situation, and then solve the problem. This, in turn, stimulates engagement with the related literature on mindfulness and information processing and decision making (during problem recognition), and sense-making and knowledge sharing (for drawing knowledge during problem-solving), toward establishing the emerging theoretical and practical gaps. The emerging research questions set the baseline for Chapter 3, in which I outline the methods employed in the study, associated decisions related to data collection, and the analysis done toward the analytical and conceptual conclusions drawn. Chapters 4, 5 and 6 present the findings of the study, which detail the crucial aspects of junior doctors' practice that facilitate them realising problematic situations, and how different resources are engaged toward solving the problem in the midst of the action. In Chapter 7, I discuss the findings by outlining their specific contribution to the existing literature on problem recognition and problem-solving mechanisms in

organisational settings. Finally, Chapter 8 concludes the study with a summary of contributions and provides directions for future research.

2 CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

The ability to solve a problem is an essential requirement for a doctor to be able to provide safe and effective healthcare to the patients. The doctors' problem-solving process in a hospital setting is a dynamic and complex process (Croskerry, 2009a) and is always the centre of attention for researchers and practitioners. In this chapter, I will critically review the literature on the problem-solving process as a key aspect of doctors' expertise in a hospital setting. In order to achieve the objectives of the study, the review of related theories of problem-solving is arranged into five sections.

First, I established the importance of problem-solving, particularly in the healthcare sector, and mainly discussed diagnostic decision-making in this realm. Diagnostic decision-making involves acquiring information from across the clinical context, making judgements about the cause of the patient's problem and deciding upon an action plan for treatment (Weiss, 2011). Second, the most prominent literature that discusses problem-solving, 'information processing and decision making' is discussed in detail and concludes that the problem-solving process involves a dual process of reasoning, i.e. analytical and intuitive reasoning. Then I reviewed the naturalist approach to problem-solving to understand the intuitive reasoning in detail and concurred that situational awareness and having the knowledge to take effective actions are essential requirements of intuitive and analytical reasoning in the problem-solving process. Hereafter, I examined the literature on the reflective practice that demonstrates the significance of tacit clues and emotions and feelings to achieve situational awareness. The third section discusses the causes of medical errors and a way forward to minimise the errors in diagnostic decision-making. Fourth, I review the implications of 'mindfulness' during problem-solving and determine that mindfulness is vital in realising any confusion in situation awareness or lack of knowledge to take effective actions that may cause problems in diagnostic decision-making. The final section reviews the literature on sense-making, knowledge sharing and the giving and taking of advice to recall knowledge and/or develop new knowledge during the problem-solving process.

This comprehensive review of the literature also identifies current theoretical and practical gaps. These gaps were translated into research questions which this study endeavours to explore. Hence, I positioned the theoretical and practical research gaps in the everyday work of junior doctors in a hospital setting and translated them into research questions to resolve the theoretical and empirical puzzles in the existing approaches.

2.2 Importance of problem-solving and decision making

Problem-solving is an activity that converts an undetermined and confusing situation into a determined one and produces desired objectives (Bransford and Stein, 1984; Dewey, 1933). The problem-solving ability in doctors is significantly important as they deal with complex diagnostic decisions in every moment of their daily work in order to provide safe and effective healthcare (Lewis et al., 2017; Jippes et al., 2010; Wong et al., 2010; Epstein, 2008; Quirk, 2006; Hall, 2002). Problem-solving is one of the most critical skills for doctors in terms of enabling them to provide safe and effective healthcare, specifically during diagnostic decision-making. Diagnostic decision-making involves acquiring information from across the entire clinical context, making judgements about the cause of the patient's problem and deciding upon an action plan for treatment (Weiss, 2011). The literature on problem-solving in the healthcare sector is mainly known as 'medical decision-making' or information processing and decision-making.

2.3 The problem-solving in organisational settings

2.3.1 Cognition in the problem-solving: Information processing and decision making

Improving problem-solving and decision making of the doctors is an essential skill in providing safe and effective healthcare to the patients. Over the past few decades, the concept of problem-solving and decision making in the health sector has been receiving attention from scholars and practitioners alike. There are broadly two models of information processing and decision making in the health sector, namely, analytical and intuitive reasoning processes (Thompson, 1999; Benner et al., 1996).

The reasoning process denotes the *cognition* in decision making. For this study, I decided to provide a quick review of both approaches, without going into the too much detailed analysis, and provide an approach that seems appropriate for this investigation.

First, the analytical approach, also known as the information processing approach, believes that the thinking processes used by the practitioners in clinical settings adhere to demanding and rational, logical steps (Banning, 2008; Graber, 2003). The information processing model of decision making employed by clinical professional includes four sequential steps. These are as follows: 1) cue recognition or acquisition, 2) hypothesis development, 3) cue interpretation, and 4) hypothesis evaluation (Tanner et al., 1987). The earliest encounter with the patient takes place at the cue recognition stage. At this stage, practitioners collect clinical information about the patient. Hereafter, practitioners develop a tentative hypothesis on the basis of the clinical information. The hypothesis generation takes place immediately after the first encounter and may be situation-specific in order to establish a relationship with previously helpful knowledge (O'Neill et al., 2005).

The establishment of a link between previous knowledge and the current situation is related to the next step of 'clues interpretation'. There is no consensus in the understanding of knowledge doctors actually rely on during the problem-solving process. At this stage, the interpretation of clues will focus on the hypothesis of supportive clues to confirm or ignore the clues that disagree with the hypothesis. In the final step, all the clues assembled will be evaluated concerning their advantages and disadvantages and conceivable support for the confirmation or rejection of the hypothesis. Although, information processing model has been validated to help the health care professional in decision making (Aspiuynall, 1979) but has been criticised as well. This is because the empirical investigations have shown that there is a high possibility of generating the wrong hypothesis (Elstein and Schwarz, 2002; Buckingham and Adams, 2000) and then counting unimportant clues and ignoring pivotal ones to accept the hypothesis (Hammond, Stewart, Brehmer and Steinmann, 1975; Bornstein and Emler, 2002; Norman, 2009). Further, in a real-life clinical context, situations are more complex, and it is difficult to merely follow a predefined

hypothesis or evidence-based knowledge (Gilbert et al., 1992; Harbison, 1991; Hall, 2002).

Second, the intuitive-humanist model is based on the intuitive judgements of the clinicians (Banning, 2008; Mok and Stevens, 2005). The intuitive judgement is “immediate knowing of something without the conscious use of reason” (Schrader and Fischer, 1987, p. 45). Intuitions are also described as “the deliberate application of knowledge, or understanding that is gained immediately as a whole, independently distinct from the usual, linear and analytical reasoning process” (Rew, 2000, p. 95). The doctor’s knowledge facilitates the interpretation of the situation. The knowledge is gained through previous experience of similar situations and their making sense of comparable patterns of clues. The interpretation of the clues is based on pattern recognition or similarity recognition, based on previous experience and ‘mindlines’ (Croskerry, 2009a; Gilovich, Griffin and Kahneman, 2002; O’Neill and Dluhy, 1997; Gabbay and Le May, 2004).

Further, the doctors make decisions under a feeling of uncertainty that leads them to an intuitive reasoning process during problem-solving (Hall, 2002). Hall coincides with Beresford (1991) that the uncertainty can stem from technical, personal or conceptual sources during the decision-making. A technical source of uncertainty refers to the factual information and scientific knowledge that can be eliminated as soon as one has the knowledge. The personal source of uncertainty demonstrates the contextual details in a complicated situation that arises from the doctor-patient interaction. The conceptual source of uncertainty is the doctors’ inability to apply and integrate the technical knowledge in generating the meaning from the entire situation.

In the messy and complex clinical settings where uncertainty is unavoidable (Hall, 2002) intuitive reasoning is necessarily part of decision making, specifically during the interpretation of tacit clues and complex information. On the other hand, analytical judgment is also significantly crucial in certain situations where junior doctors interpret the blood reports, x-rays, deciding medication etc. Many have abandoned the dichotomous view of decision making, whether analytical or intuitive, and proposed that the analytical and intuitive approaches form two ends of a continuum of decision making (Hammond, 2000; Hamm, 2004; O’Neill and Dluhy,

1997; Offredy et al., 2007; Norman, Barraclough, Dolovich, and Price, 2009). By bringing both models together we can say that the decision making depends on the initial acquisition of information/clues, situational clues, interpretations of clues; i.e., can be based on analytical reasons or pattern recognition, developing assumptions and taking further actions (O'Neill et al., 2005; Norman et al., 2009).

The initial data collection, during analytical decision making and problem-solving, is based on utilising tools and technology to learn about previous patient clinical history. This data is the information gathered from records, notes, and/or the patient computer database. At this stage, practitioners' textbook knowledge, behaviour and experience facilitate anticipation of the patient's problem. In other words, initially, practitioners start an exploration of information and clues by previously held knowledge and mindlines (Gabbay and Le May, 2011; Hattie and Timperley 2007). The 'mindlines' are acquired through "the experience of previous cases, dimly recalled undergraduate textbooks, the research summarised in articles read since guidelines recently discussed, stories of the experiences of colleagues and so on" (Gabbay and Le May, 2011, p. 57). The risk level associated with each patient problem is evaluated, and then an action plan is developed to reduce the most alarming risk levels (Thompson et al., 2001).

The practitioners start by working on the problem as they interact with the patient by taking a history, examining new information and the clues emerging, the practitioner simultaneously modifies actions and thinking patterns; this all takes place in the midst of interaction with the patient. It provides 'practicums'; i.e., a setting for learning practice (Schön, 1987, p. 37) or a 'site of knowing' (Nicolini, 2011, p. 602). In this process, being mindful of what is implemented, and information that emerges during the encounter with the patient is essential when modifying existing knowledge/mindlines. The final step now is building a hypothesis, by looking at the whole situation and analysing the collated information and clues. This analysis can be based on pattern recognition or can be analytical in nature. These steps correspond to the decision making of healthcare professionals in hospital settings (Benner and Tanner, 1987; O'Neill et al., 2005).

Several empirical investigations demonstrate making judgements in medical settings and understanding the clues and information by matching and contrasting with other clues in the context at the same time (Markman and Gentner, 2001; Bassok and Medin, 1997; Markman, 1996). Previous studies demonstrate that the interpretation of the clues and information is not mutually exclusive; each clue interacts with other contextual information and can change the professional meanings, resulting in a complex process of problem-solving. These empirical investigations provide the groundwork to study the complexities of decision-making in a real work setting to improve our understanding of the reasoning process in problem-solving, and that also includes the significance of the role played by both the situation and the knowledge of the problem solver. In order to understand the phenomenon of interpretation of the situation in the following section, I will analyse the naturalist decision-making process that pays attention to the situation and knowledge required to take action, in order to understand the context that assists the reasoning process.

2.3.2 The Role of situational awareness and knowledge for the skilled actions in problem-solving

The naturalist decision-making approach aims to study human decision-making in a real work setting (Klein, Orasanu, Calderwood and Zsombok, 1993). This claim sounds a little odd as research has a long history of exploring how doctors make decisions, as I have discussed in the previous section. However, most of the studies on information processing and decision-making are based on professional decision-making in a controlled environment where options are well structured to identify the optimal process of decision-making. Due to these limitations, information processing and the decision-making approach have been criticised because it does not capture the complexities of problem-solving processing in a real work setting (Norman et al., 2014). The naturalist model, in turn, focuses on the dynamic and changing nature of decision-making in a real work setting. There are several modes of naturalist decision-making styles, but for this study, I discuss and engage recognition-primed decision (RPD). RPD has received much broader acceptance from researchers and practitioners. According to RPD, a decision maker contiguously assesses the situation and takes skilled actions at every opportunity to lead them towards the desired objective to solve the problem in hand. The skilled actions are based on the

knowledge gained by practitioners through the experience of the repertoire of patterns (Klein, Calderwood and Clinton-Cirocco, 1986). Thus, RPD suggests two significant aspects of decision-making besides cognition, situational awareness and knowledge in order to facilitate actions in problem-solving.

First, situational awareness is an integral part of a practical problem-solving process. It involves keeping track of contextual information and sorting the information in accordance with the problem in hand and generating meanings (Crandall et al., 2006; Locke, 2011). The accurate assessment of the situation indicates the richness of information collected from the context to solve the problem that is also imperative for the analytical reasoning process (Norman, 2009). During the process of situational awareness, a professional takes one option and works through it to see if it works. For example, in the empirical investigation, Herbert Simon (1957) suggests decision-making as a way of working through the first option rather than trying to find the best possible option. The cognition during the problem-solving is both intuitive and analytical at the same time and concords with the dual process theory of decision-making that intuitive and analytical reasoning work simultaneously to achieve the plausibility for the selected course of action.

Second, the critical aspect is the attention paid to the selection of the course of action by the decision maker during problem-solving. The actions are guided by personal knowledge (Polanyi, 1962). Effective knowledge is usually tacit and inculcated in the experience of dealing with problems in the past and interactions with other professionals. In recent healthcare literature, Gabbay and Le May (2004) stressed that doctors' knowledge as used in problem-solving is not merely evidence-based knowledge, but is the knowledge that is spelt out as 'mindlines'. These mindlines are tacit and are a blend of knowledge gained in medical education, training and experience of working in communities of practice (Gabbay and Le May, 2004). This knowledge is gained through education, previous experience and social interactions; in other words, by working in a specific community of practice (Wenger, 1998; Gabbay and Le May, 2004). Hence the primary skills of problem-solving vested in a transaction between situation and actions led me to the reflective practice (Dewey, 1933; Schön, 1983), which pays attention to how practitioners capture tacit clues and take responsive actions during problem-solving.

As I am focussing on the decision-making process of junior doctors, Randel, Pugh and Reed (1996) show that junior doctors lack or pay less attention to the situation and are more inclined toward taking the right actions during the decision-making process. I propose that the lack of or incompetency of capturing the real situation will eventually influence the actions and interpretations of the information, and so also of decision-making. Consequently, junior professionals are more prone to errors in problem-solving and decision-making. Contemporary empirical studies have indeed suggested that actions and body sensory clues and context can shape and influence the cognitive process during problem-solving or decision-making (Croskerry, 2009b; McBee et al., 2015). Durning and colleagues (2011), for instance, state that the contextual factors increase the cognitive efforts during decision-making and decisions become more exposed to errors. It is thus essential to explore how situation awareness can be improved in junior doctors' specific actions. For this purpose, I looked into the literature on reflective practice, which suggests that body and emotions play an important role in achieving situational awareness.

2.3.3 The role of body and emotions in the problem-solving

Problem recognition is prerequisite to solving the problem in action. The problem in an activity is undetermined, confusing and discomfoting situations that something is not fully grasped in practice, or that leads to undesirable outcomes (Dewey, 1933; Schön, 1983; Cunliffe and Easterby-Smith, 2004), which can only be felt with a rich awareness of situation (Norman, 2009; Locke, 2011). The literature suggests that problematic situations trigger a responsive action of the practitioner to solve the problem and are given different terms for problem recognition, such as discomfort, surprise, inner discomfort, uncomfortable feelings, 'critical point', 'struck in action' and 'issue in action' (Boud, Keogh and Walker, 2013; Johns, 2005; Cunliffe, 2002; Barnett, 1997; Atkins and Murphy, 1993; Schön, 1983; Dewey, 1933). The multiplicity of terms used to indicate problem recognition suggests that practitioners face problems of different nature and complexity. It also suggests that the observance of situations guides practitioners to take actions associated with recognising different types of problems in their daily tasks (Tsoukas and Yanow, 2009).

Schön (1983) argues that knowing-in-action is a precursor of realising surprise or defining the problem in action. He emphasises that knowing-in-action is important, as this is where practitioners learn embedded and embodied knowledge. Knowing-in-action, as the term suggests, is the knowledge that is embedded in, and which cannot be separated from action, whether that action is a physical or a mental process. During the act of knowing-in-action, practitioners “are spontaneously undertaking actions and making judgements, which they already know how to perform. They do not have to think consciously about how to perform these routine activities” (Schön, 1983, p. 54). So, knowing-in-action to reach the problem requires skilled bodily actions in collecting clues and contextual information, particularly in medicine (Gawande, 2002).

The practitioners negotiate with contextual information and clues to determine something is wrong. As Schön (1983) argues, that practitioners involve themselves in a conversation with the context of practice and respond to the ‘backtalk.’ Backtalk can be understood as a specific response of physical objects involved in reaction to the practitioner's move that facilitates recognising surprise and defining the problem. The material backtalk can be demonstrated in the context of healthcare as patient gestures of pain, sweating, lethargy on the one hand, and blood reports, x-rays, etc. on the other, which represent situated clues and information. Additionally, contextual information also includes emotions and feelings arising from the context, as Lindeman (1945) suggests that they are also important in the understanding of the experience. For instance, Fotaki (2015) argues that employees’ compassion for the patient is an important feature of good practice and facilitator of pragmatic thinking in the best interest of patient care.

Similarly, Schön (1983) highlights the significance of feeling and emotion in suggesting the construct of ‘surprise’- upsetting outcomes during professional accomplishments. The rationale described by Schön (1983) and his followers is that the learning and ‘knowing in action’ are interconnected with associated feelings and emotions, and these emotions are an essential aspect of a reflective learning process. He argues that when the conditions of feelings and emotions naturally diffuse in our thinking process, the latter becomes more useful and productive (Bolton, 2010). Conscious account of feelings (such as feeling anxious, confident, satisfied or

disappointed) and emotions in reflection have thus been highlighted in the empirical literature on reflection (Bulman and Schutz, 2013; Knott and Scragg, 2013; Boud, Keogh and Walker, 2013).

The moment practitioners encounter a problem in action they thus consciously involve in solving the problem by modifying their actions and thoughts. This problem-solving process of modifying actions and thought is broadly known as reflection-in-action (Schön, 1983). Reflection-in-action involves consideration of the experience, relating it with our emotions, feelings, contextual information and clues (that emerged during problem recognition process) and attending to the prior knowledge to solve the problem in hand. It entails constructing new understandings to inform our actions in the situation that is unfolding (Schön, 1983).

The idea of *prior knowledge* is a fundamental feature of problem-solving in the midst of the action. Similarly, Dewey (1933) suggests that we need a plentiful stock of knowledge and contextual information to develop valid and authentic assumptions to solve the problem. Schön's (1983) idea of 'the prior understandings' suggests the stock of assumptions needed to solve the problem is aligned with Dewey's concept of recalling assumptions from a personal stock of knowledge. Schön (1983) proposes that it is 'artistry' that represents the real knowledge that enables professionals to solve the problem in the midst of actions. So, for the practitioners to be involved in reflective thinking, they essentially need to have a rich stock of knowledge on which they can base the assumptions. Similarly, Gabbay and Le May (2011) suggest that doctors rely on their tacit knowledge, i.e. 'mindlines' during problem-solving processes.

The literature on reflective practice, parallel with naturalist model, suggests three crucial aspects of achieving situational awareness during problem-solving. First, there is a significant role of tacit clues and observations of material involved in professional practice. Second, the emotions and feelings that arise from the situation are also important aspects of situation awareness. Finally, the body plays a vital role as "hands and feet, apparatus and appliances of all kinds" are part of the thinking process in problem-solving (Dewey, 1916, p. 16).

However, the process of problem recognition mainly depends on the practitioner's capacity to collect and interpret the situated clues and information. In the process of acquiring information and clues, professionals are engaged in skilled physical actions and an attentiveness to the related details of an activity. They also required an ability to conversate with the context in constructing their theories of practice and interpret the information and clues as a problem in a given situation. The literature stresses the importance of recognising problems in practice but did not explore it further in much depth toward proposing how can we develop the capacity of recognising the problem in junior professionals. Also, assuming that novices can interpret a situation automatically seems implausible as to rely on multiple bodily skilled actions and interpretation of clues and information, they must need some kind of mindfulness (Tsoukas and Yanow, 2009). We thus need trained junior professionals accordingly to the demands of a specific profession, to make them capable of problem recognition.

2.3.4 Summary

In summary, the problem-solving process has the following essential features. First, during the problem-solving process, practitioners are involved in information acquisition and interpretations (Norman, 2009). The interpretations of the information could be based on analytical reasoning and intuitive reasoning, according to the nature of the situation. Further, the broader contextual information can influence the cognition of practitioners (Durning et al., 2011; McBee et al., 2015). Second, the effectiveness of the problem-solving process is dependent on the extent of situational awareness and knowledge of actions required in a given situation (Klein et al., 1993). Third, with regard to the situational awareness, practitioners are involved in tacit knowledge-in-action, where practitioners capture tacit clues and emotions and feelings that guide their actions. Finally, in this knowing and interpretation of information and clues based on professional knowledge, such as mindlines and artistry (Gabbay and Le May, 2004; Schön, 1983), a consolidated form of knowledge is gained through formal training, experience and social interactions. This knowledge base guides practitioners to take effective actions and make decisions during the problem-solving process. Finally, the literature also shows that junior doctors usually pay more attention to their actions during decision-making and lack a full grasp of

situational awareness (Randel, Pugh and Reed, 1996). Experts appear to demonstrate situational awareness instantly and spontaneously, which is in line with Schön (1983) who suggests that practitioners do their work and ‘knowledge-in-action’ without any conscious effort until a problem arises. However, novices, like junior doctors, may lack such ability to capture and assess the situation (Randel, Pugh and Reed, 1996; Yanow and Tsoukas, 2009). In addition, how junior doctors maintain attention of a situation so that they may be aware if something is wrong with their actions and can update their knowledge, artistry and mindlines (Schön, 1983; Gabbay and Le May, 2011) in order to take corrective actions at the right time, still remains relatively empirically unexplored. Doing so however is essential, especially in contexts like the NHS, as described below.

2.4 Major causes of errors in healthcare decision making

The UK NHS provides excellent lifesaving services to their patients, but many preventable errors occur too. In the recent report of the Policy Research Unit in Economic Evaluation of Health and Care Interventions (Elliott et al., 2018), they provided some shocking numbers regarding errors in the NHS. The report estimated that 66 million potentially clinically significant errors occur per year. The report further accentuates that these errors cost the NHS approximately £98.5 million per year, causing 712 deaths and contributing to 1708 deaths every year.

Further, empirical investigations and literature reviews explored the leading causes of errors in diagnosis and decision-making (e.g., Croskerry, 2003; Elstein, 1999; Graber, 2005; Hall, 2002). They all suggest overlapping reasons for errors in decision-making during problem-solving. Graber (2005) examined cognitive errors in a five-year-long empirical study. He divided the causes of the errors into four main categories: lack of knowledge, faulty data collection, faulty interpretation of data and faulty verification. He suggests that due to a lack of knowledge, doctors are unable to take the correct actions and interpret the information, which coincides with my review that a specific knowledge set is required for effective problem-solving; for example, with the use of ‘mindlines’ (Gabbay and Le May, 2004). The causes of faulty data and faulty verification can be addressed if we can maintain a rich awareness of the situation. Similarly, Hall (2002) reviewed the related literature and proposed that

uncertainty during problem-solving in healthcare can stem from technical sources, personal sources and conceptual sources. Again, he mainly focuses on the knowledge base and indicates that the appropriate knowledge base is a blend of explicit and tacit knowledge of the practitioners in the problem-solving process.

2.5 The way forward

The review of related literature on problem-solving and decision-making has shown two critical features of effective problem-solving; namely, gaining rich awareness of the situation that provides authentic information, and a specific knowledge set that guides actions and interpretations of information. However, in the organisational setting, the activities of professionals are messy and complex (Nicolini, 2013; Schatzki, 2001; Engeström, 2000), making it continually challenging to record relevant information and clues. This is particularly the case for novices, like junior doctors (Brooks, LeBlanc and Norman, 2000). Accordingly, the literature suggests that the process of defining the problem cannot be taken as being spontaneous or automatic for the novice (Yanow and Tsoukas, 2009). Instead, it suggests that specific mindfulness; i.e., an attentive mind and body and sitting in the present helps to captures clues, internal thoughts, feelings and emotions in order to make distinctions in the course of activity (Epstein, 1999; Weick and Putnam, 2006).

Further, in the debate on developing tacit knowledge, we cannot separate such learning from the actual activity (Billett, Harteis and Gruber, 2014; Bourdieu, 1977; Chaiklin and Lave, 1996; Nicolini, 2011). The conventional notion of skilful performance is that the novice first acquires a knowledge base and skills, and then they subsequently can implement those skills and knowledge in a new situation when required (Zukas and Kilminster 2012). Such separation of knowledge and skills acquisition from its application is much criticised in the domain of learning (Dall’Alba and Barnacle, 2005; Lave and Wenger, 1991). Junior doctors can hardly develop their mindlines (Gabbay and Le May, 2004) just by thinking about the experience themselves. For this purpose, we need to rethink professionals’ engagement in practical accomplishments to appreciate the complexities of the process (Yanow and Tsoukas, 2009) of problem-solving and interactions with social and material resources to develop knowledge and mindlines of a novice in this

endeavour. In the case of novices, the active use of social and material resources can provide a new set of knowledge to solve the problem. Such knowledge is new to them but not to the practice itself. The practice-based approach is congenial for inquiry that takes engagement in real work seriously (Nicolini, 2011; Chia and Holt, 2006; Cunliffe and Easterby-Smith, 2004; Weick, 2003).

Moreover, the recruitment of situated clues and information requires organised and skilful bodily action that can only be developed by making focused efforts as a part of '*participating*' in practice itself (MacIntyre, 1985; Nicolini, 2013; Schatzki, 2001; Wenger, 1998). It does not presume that activity is entirely the result of reasoning and cognition. The practitioners' emerging understanding of a situation may draw equally as well on kinaesthetic, aesthetic or other sorts of bodily intelligence (e.g., Gawande, 2002) and interactions with social and material resources to develop and modify knowledge (Wenger, 1998; Gabbay and Le May, 2004).

Hence, to achieve full awareness of the situation, a novice may need mindfulness of their actions and situation (Epstein, 1999; Weick and Putnam, 2006) to articulate if something is wrong or problem arises in their knowledge, actions, and/or information. Moreover, novices also need to use social and material resources to develop new knowledge and mindlines during the problem-solving process. The next two sections are thus dedicated to reviewing the literature of 'mindfulness' and 'sense-making and knowledge sharing' to develop a rich understanding of the use of social and material resources in problem-solving and position the research questions.

2.6 Mindfulness

In organisational settings, capturing clues and related information is ever challenging for the practitioners. Consequently, they require some attentiveness, mindfulness and an open approach to the possibilities (Yanow and Tsoukas, 2009). The concept of 'mindfulness' which refers to a "rich awareness of discriminatory detail" coupled with a "capacity for action" (Weick and Sutcliffe, 2006) can help us to understand how junior doctors can capture related clues and information to define the problem.

Mindfulness is an ancient concept that is rooted in Buddhist philosophy, though there are various definitions of mindfulness that refer to the historical and philosophical nature of the phenomenon (Shapiro et al., 2007). They consider mindfulness as a type of meditation. Because mindfulness bears a focused awareness of individuals' internal and external worlds, including sensation, emotions, thoughts, actions and environment as they exist in a given moment, it has been termed as 'lucid' or 'pure' awareness (Sogyal, 1992). However, such a description offers a more intuitive and tacit nature of mindfulness (Shapiro et al., 2007). Consequently, due to the purpose of the current research, I am concerned about the concept of mindfulness that draws from philosophical schools (Dewey, 1938; James, 1975; Polanyi, 1962) as well as learning (Schön, 1983) and development (Gilligan, 1993). The reason for my selection is that, on such lines, the concept of mindfulness becomes convergent and applicable in professional practice (Epstein, 1999).

On review of an extensive body of literature on mindfulness, in order to settle on a unified definition, I come to the following conclusions. First, mindfulness is, as congruent with most of the literature, a state of heightened consciousness (Rosch, 2007; Harvey, 2000). As a mental state, mindfulness is not something that one possesses, and another lacks. Developing this further, attaining mindfulness is an innate human capacity (Kabat-Zinn, 2003). It means most people, even novices, can be mindful in their actions. Thus individuals, and particularly novice doctors need to make a more conscious effort to develop the trait of mindfulness.

The second feature of mindfulness (state of consciousness) is the ability to pay attention to the phenomenon of present-moment. To establish mindfulness, individuals should/must be focused on the 'here and now' (Herndon, 2008, p. 32), as opposed to being preoccupied with the past or the future (Brown and Ryan, 2003). Further and Thondup (1996) explains mindfulness as 'giving full attention to the present' (1996, p. 48). In short, mindfulness is being there in the present, with both the body and mind, to appreciate the present moment (Weick and Sutcliffe, 2006) may facilitate capturing related backtalk and contextual information more effectively.

Third, mindfulness comprises heeding external and internal factors during the activity. It means that practitioners pay attention to external factors and internal

factors. The external factors include the various clues and backtalk generated by the materials involved in the activity generates, such as the use of tools and technology, contextual information, artefacts, blood reports, etc. The internal factors include the implications of existing knowledge, bodily actions and processes and techniques used, emotion, feelings that emerge in the context of the activity (Epstien, 1999; Harvey, 2000). Mindfulness is a tool to capture external and internal factors during the moment of practice effectively (Brown and Ryan, 2003). It also includes making distinctions about what I am doing and why I am doing it, an evaluative approach to activity with an openness towards new information and its interpretation (Raelin, 2001; Brown and Ryan, 2003; Langer, 2000; Langer and Moldoveanu, 2000). Such mindfulness and openness are prerequisite conditions for defining the problem (Dewey, 1983; Schön, 1983; Yanow and Tsoukas, 2009; Jordan, Messner and Becker, 2009).

In summary, mindfulness is “the awareness that emerges through paying attention, on purpose, in the present moment, and non-judgmentally to the unfolding of experience moment by moment” (Kabat-Zinn, 2003; p. 145). Attention rests with various stimuli of mind and body, including bodily sensations, breath, perceptions (sights, sounds) (external factors), as well as cognition and emotions (internal factors) (Epstien, 1999; Langer, 2000; Kabat-Zinn, 2003; Weick and Putnam, 2006). Such mindfulness of external factors and internal factors is essential for junior doctors in defining problems in action (Randel, Pugh and Reed, 1996; Schön, 1983; Dewey, 1933; Yanow and Tsoukas, 2009). It means mindfulness can enable junior doctors to capture related information and clues from the context and also encapsulate the relational emotions and feelings. Further, researchers also indicate that personal dispositional factors and knowledge (Epstien, 1999) can influence the degree of an individual’s mindfulness in an activity (Baer, 2003; Baer et al., 2004; Giluk, 2009). Similarly, mindfulness is stated as being ‘moment-to-moment’ attentive and as a way of directing the inquiring based on existing knowledge (Epstein, 1995).

However, despite the definitions and theoretical explanations such as these, we know little about how mindfulness is operationally achieved by junior doctors that enables them to capture all the related information and clues in the problem recognition process. As Weick (2011) notes, mindfulness as a continuous process of

accomplishment of everyday work. The empirical investigations in healthcare mostly explore how mindfulness may have an influence on stress reductions, well-being, burnout, emotional exhaustion etc. (Shapiro, Brown, and Biegel, 2007; Jain et al., 2007; Galantino et al., 2005) but remain scared in exploring how mindfulness can be achieved during the practice of everyday work. To understand the manifestation of mindfulness in collecting rich and authentic information and clues in the given activity to realise the problem is significantly important. It suggests exploring the activities on which doctors' limited attention is allocated, what is noticed at the micro level and how this self-directed attention empowers a doctor to achieve desired results.

2.6.1 Summary

In summary, being mindful of internal and external factors and information processing may help junior doctors to recognise the problem in their practice, as theoretically established in this section. Since, researchers have indicated that personal dispositional factors and knowledge (Epstien, 1999) and contextual factors influence mindfulness and information interpretation (Baer, 2003; Durning et al., 2011) in decision making. However, these definitions and theoretical explanations are a productive starting point and act as a theoretical framework for further empirical explorations. We know little about how mindfulness is actively achieved by junior doctors that enables them to capture all the related information and clues, and how these situated activities and clues influence the situational awareness to make a decision about the problematic situation is relatively unknown in healthcare. Hence, the first question to explore in the real work settings of junior doctors is, "*How is mindfulness and information processing manifested in the situated processes of junior doctors' problem recognition during their everyday work?*" Hence, when a problem is there, practitioners need to make sense of the situation and recall or develop a knowledge base to solve the problem. That is discussed in the next section.

2.7 The role of sense-making and social and material resources in problem-solving

As we have noticed in the previous discussion on problem recognition, during mindfulness-in-action, problems or discomfort in decision making can arise from external factors (situational awareness) or internal factors (e.g., emotions, feelings, and knowledge). The external factors causing a problem in action, can be based on a lack of information, missed clues, lack of ability to interpret clues or understanding the overall context in order to solve the problem (Norman et al., 2014; Graber, 2005; Klein et al., 1993; Crandall et al., 2006; Locke, 2011). Later, the internal factors indicate a lack of textbook knowledge, behaviour and experience, procedural knowledge, i.e. mindlines (Jennifer et al., 2017; Gabbay and Le May, 2011; Graber, 2005), the practitioners need to use available sources of knowledge, perhaps through textbooks, online databases, or colleagues to develop related knowledge to solve the problem. It shows that there can be two approaches to solve the problem-in-action, based on the emergence of a problem (due to external and internal factors).

It shows that there can be two approaches to solve the problem-in-action, based on the emergence of a problem (due to external and internal factors) in decision making. If a problem emerges from external environmental factors (situational awareness), the sense-making concept (Weick, 1993) will be helpful when attempting to understand the problem-solving process. On the other hand, if the problem appears to be due to internal factors i.e. lack knowledge to solve the problem (Jennifer et al., 2017), Drawing on social learning (e.g. Wegner, 1998), and literature on knowledge sharing mechanisms (Gabbay and Le May, 2004; Ferlie, Crilly, Jashapara and Peckham, 2012; Cabrera and Cabrera, 2005), one can suggest that a novice can develop the required knowledge by using social and material resources (people, paper, electronics) as sources of information and knowledge. In the context of this research, *material resources* denote ‘guidelines’, books, protocols, policy information in paper or electronic form, and *social resources* refer to the members of that community of practice (Wenger, 1998). Now, I quickly review these two approaches, sense-making and knowledge sharing mechanisms to understand the junior doctors’ problem-solving process.

2.7.1 Sense-making

Sense-making initiates when a routine, ongoing activity is interrupted by a feeling that something is not fully grasped, by surprise, or by being struck in the situation (Dewey, 1933; Schön, 1983; Cunliffe, 2002; Weick, 1995; Gioia and Thomas, 1996; Weick, 1993). The sense-making process is always connected with the set of data that engenders feelings “that something is not quite right, but you cannot put your finger on it” (Weick and Sutcliffe, 2006, p. 31). The fundamental sources of data on patient care come from the mindfulness and activities carried out by the practitioner during the information collection process, as discussed in the previous section. However, still, there are inherent limitations of human mind and biases for ignoring important clues or giving more weighting to specific information that contributes little to understanding the situation (Hammond, 2000; Hamm, 2004). Therefore, as a problem is recognised in practice, practitioners struggle to make sense of the situation and take corrective actions (Schön, 1983; Weick, 1995).

Sense-making follows a specific process when practitioners make an effort to solve the problem that interrupted an activity (Sandberg and Tsoukas, 2015; Weick, 1995). The review of the literature suggests it comprise of three interrelated processes: creation, interpretation, and enactment (Sandberg and Tsoukas, 2015; Weick, 1995). More specifically, the creation process involves bracketing, bringing together, noticing and extracting clues and information from our current experience of the problematic situation. This strategy is akin to the notion of enhancing situational awareness or review of external factors (Klein et al., 1993; Weick and Sutcliffe, 2006). Such collection of important information and clues from what has recently transpired provides an initial sense to interpret them; i.e., ‘interpretation’ (Weick, 1995, p. 35) as interaction with the context in a critical manner. It suggests that the ‘creation’ process is fundamental in making sense of the situation and building an understanding of the current situation.

On the other hand, Sandberg and Tsoukas (2015, p. S14) suggest that the large majority of studies on sense-making, almost 84%, considered creation and interpretation as one phenomenon, making it ever challenging to understand the role of ‘creation’/bracketing in sense-making. The role of creation is to understand the

nature and source of the problem, which is important to be able to draw specific knowledge base to solve the problem through the use of available existing knowledge of the practitioners or use of social and material resources to draw new understandings. We need to understand how a professional selects a particular set of data from the situation to define the nature of knowledge required to manage the problem.

After the collection of a relevant data set and clues, practitioners relate this pattern of clues and information with their previous experience and knowledge to decide on an action plan to solve the problem (Dixon and Dohn, 2003). Furthermore, the practitioner takes corrective actions as ‘enactment’ to solve the problem. Practitioners do not just immediately make sense of a situation, but they interpret it, act, then again evaluate and perhaps collect more data, interpret again and act to solve the problem by recalling their knowledge. Sensemaking is thus an iterative process (Weick, 2011; Maitlis and Lawrence, 2007).

Moreover, one of the important aspects of sensemaking is that it is also collective in nature. During the processes mentioned above of sensemaking, practitioners interact with colleagues, engage in gossip, discuss situations, tell stories, seek information through reading and access data sets (Sackman, 1991; Sandelands and Stablein, 1987; Gioia and Thomas, 1996; Isabella, 1990; Gioia and Chittipeddi, 1991). The literature on social learning (e.g., Wegner, 1998), and literature on knowledge sharing mechanisms (Gabbay and Le May, 2004; Ferlie, Crilly, Jashapara and Peckham, 2012; Cabrera and Cabrera, 2005), can be helpful in this endeavour.

2.7.2 Knowledge sharing and socially constructed mindlines

When practitioners face a problem that goes beyond the scope of their knowledge, they tend to explore the solution in organisational settings (Rogers, 2004). In the healthcare literature, Everett Rogers’s seminal work ‘Diffusion of Innovation’ (2004) has a great influence on understanding how knowledge spreads in healthcare settings. He posits a five-stage linear model of knowledge sharing and the process by which practitioners collect and adopt new information from colleagues and other sources. The practitioners’ understanding of the problem and behaviour has a significant influence on the utility of resources for knowledge. If practitioners require

information and guidance during problem-solving, they tend to look for it and try it to see if it solves the problem. Rogers (2004) presented the idea of knowledge collection as being linear and much more straightforward than it actually appears in complex and messy organisational settings (Nicolini, 2011; Sandberg and Tsoukas, 2011). For example, the influential study of Van de Ven and Poole (1990) shows that the process of knowledge acquisition in organisational settings is much dynamic and less linear than that proposed by Rogers (2004). Therefore, it is unsurprising that attempts to implement the evidence-based problem-solving process, which usually assumes a linear process of problem-solving, are not practically helpful (Hall, 2002). There is indeed acceptance of the idea that problem-solving in healthcare is anything but a linear process of implementing evidence-based knowledge (French 1999; Dopson and Fitzgerald 2005).

My focus here, however, is not on how information flows in the organisation, but on how doctors assemble knowledge during the problem-solving process. The rich understanding of sensemaking in organisational settings requires a deep insight into the process of “collective sense-making by which knowledge, both tacit or explicit and from whatever sources, is negotiated, constructed and internalised in routine practice” (Gabbay and Le May, 2004, p. 1). As Engeström and colleagues propose in their concept of ‘collective memory’, “what would be more natural than to ask your nearest co-worker when you do not remember something” (Edwards & Middleton, 1990, p. 144 cited in Gabbay and Le May, 2011). These sources can be literature, online databases and guidelines on the one hand, and colleagues and communities of practice on the other. The collectively established knowledge-sharing mechanism is useful in revealing overlooked aspects of creation, interpretation and enactment. That is, most of the errors in the problem-solving process emerge due to the activities of the data collection process, such as ignoring some aspect of information and underestimating the risks associated with information and clues (Graber, 2005). Similarly, interpretations of the clues by the individual practitioner is biased on self-confirming reasoning (Hall, 2002), and therefore, social and collectively reinforced knowledge in interpreting a situation and problem-solving is a useful tool in organisational settings (Raelin, 2001; Gabbay and Le May, 2004).

Problem-solving in the healthcare sector entails a broader range of ‘social and material resources (people, paper, electronic) as sources of knowledge and deriving sense from them (Nicolini, 2013; Gabbay and Le May, 2004; Wenger, 1998). The concept of utilising social and material resources suggests that deriving knowledge in organisational settings is a hard work of collecting heterogeneous pieces of know-how from social, contextual, technical and textual sources, fitted together to solve the existing ambiguity in the situation (Nicolini, 2013; Gabbay and Le May, 2004; Bennett et al., 2006; Cogdill et al., 2000; Wenger, 1998). In the remainder of the thesis, and in order to make the discussion lucid and easy to understand, I will use the term ‘*social resources*’ to refer to all people resources, and members of communities of practice (Wenger, 1998) that can be used in organisational settings. Similarly, I will use the term ‘*material resources*’ to describe all the other sources, such as the use of technology to access information, databases, books and protocol guidelines etc. (Nicolini, 2013).

In a difficult situation, and after analysis of the nature of the problem, the existing literature suggests that practitioners approach authorities and trustworthy colleagues to get advice in a given situation. In particular, the process of interactions with social and material resources in the problem-solving process is notably empirically investigated in the ethnographic study of expert general practitioners (GPs), nurses and pharmacists by Gabbay and Le May (2004). Gabbay and Le May (2004) elaborate on the process of utilising sources in reshaping ‘mindlines’. Such mindlines are “iteratively negotiated with a variety of key actors, often through a range of informal interactions in fluid communities of practice” (Gabbay and Le May, 2004, p. 3).

According to Gabbay and Le May (2011), it is doctors’ mindlines that represent working knowledge during the problem-solving process. First, ‘mindlines’ are internalised as the tacit knowledge of a doctor; i.e., guidelines-in-the-head, that they use in the everyday decision-making and problem-solving process. Doctors acquire their mindlines over a lifetime, informed by their training, by their reading (e.g., by evidence-based knowledge), their own and each other’s experiences, their interactions with colleagues and patients, their understanding of context and system, and experience of handling problems and solving them. Gabbay and Le May (2011)

describe “the experience of previous cases, dimly recalled undergraduate textbooks, the research summarized in articles read since, guidelines recently discussed, stories of the experiences of colleagues and so on” (p. 57); all these kinds of evidence and knowledge blend with the tacit knowledge of experience and social interactions to become internalised as a doctor’s personal guidelines (mindlines). The process of developing mindlines makes mindlines less rigid, compared to evidence-based medicine, and more applicable in the dynamic situations of problem-solving. Hence mindlines are the doctor’s internalised personal guidelines.

Second, when doctors are exposed to a tricky situation/problem or in discussion with a colleague, this challenges their ‘mindlines.’ When a situation challenges the mindlines, practitioners make a conscious effort to adjust existing mindlines and modify them according to the current situation. Sometimes mindlines are challenged through interactions with a trusted colleague whom they believe to be an expert in a specific topic. Gabbay and Le May (2011) also suggest that the effectiveness of shaping mindlines depends on the specific skills and traits of doctors. Gabbay and Le May (2004, p. 3) claim that “the practitioners nearly always took shortcuts to acquiring what they thought would be the best evidence base from sources that they trusted [...] These sources included the popular doctors and nurses”. Examples include knowing whom to trust for reliable advice about a specific topic, being critical in the discussion, being ready to be challenged, trying to call into question the thinking and grounds of the advice, a comfortable climate of respectful critical dialogue and accepting mutual responsibility. These interactions can be both social and material resources in terms of modifying mindlines, but in their empirical investigation, they never witnessed the use of online resources or guidelines by experienced general practitioners (GP). As Gabbay and Le May (2004, p. 2) state, “not once in the whole time we were observing them. Neither while we observed them did they read the many clinical guidelines available to them in paper form or electronically, except to point to one of the laminated guidelines on the wall in order to explain something to a patient or to us”.

Likewise, Borgatti and Cross (2003) empirically sought to explore the significant factors that influence the decision of when to seek information from other people in an organisational setting. They found that three factors influence the

decision associated with the selection of co-worker for taking advice and information. First, the selection decision is likely to be affected by one's understandings of another person's expertise. Second, the information seeker must value the knowledge of the other person, akin to Gabbay and Le May's (2004) 'popular doctors' at the workplace. Third, Borgatti and Cross (2003) also highlight that a specific person with specific expertise can only be approached if she is accessible in a given time when the help is required.

Further, Hogarth and Einhorn (1992) added that who suggest that people discount (ignore) the suggestions according to their needs and requirements of the problem in a given situation. Discounting of suggestion is based on the personal assessment of the situation. Furthermore, Dopson and Fitzgerald (2005) argue that the decision and choice to use information and knowledge-seeking mechanisms is not straightforward in healthcare. Junior doctors are likely to need to be selective in choosing specific sources of information and knowledge to solve the given problem (Dopson and Fitzgerald, 2005; Hultin and Mähring, 2017; Huber, 1991).

In summary, during problem-solving and socialisation, practitioners develop networks: they know about popular doctors and know their expertise (Lave and Wenger, 1991). The distribution of knowledge and information across organisational resources (social and material) and their availability vis-a-vis contributing to solving the problem are not homogenous within organisational settings (Nicolini, 2013; Wenger, 1998). Moreover, there are mixed findings in the health sector about the use of text, online databases and guidelines in problem-solving (Gabbay and Le May, 2004; Casebeer et al., 2002; Cogdill et al., 2000). Some suggest that online resources and guidelines are helpful sources in problem-solving (Casebeer et al., 2002; Cunliffe, 2002; Kalsman and Acosta, 2000; Podichetty, Booher, Whitfield and Biscup, 2006), some suggest they are rarely used in actual practice (Gabbay and Le May, 2004).

It is important to understand the role of various resources (social and material) in the problem-solving process in the junior doctors' everyday work. Further, this study aims to explore how such selection of social resources is operationally carried out in the context of the hospital in junior doctors' practice, to complement Gabbay and Le May (2004), which was set in the context of primary care. The main difference

between the hospital and primary care settings lies in the distribution of responsibility and working structure. In a hospital setting, doctors are working in collaboration with other team members; conversely, in a primary care setting, doctors have much more autonomy in their work activities in terms of patient management. Hence, two questions emerged from the literature review, to be explored in an empirical setting: 2) How do junior doctors decide when and why to use social and material resources in the midst of their problem-solving process? 3) How do junior doctors work with social and material resources in the midst of their problem-solving process?

2.8 Chapter summary

The study endeavours to explore two main aspects of junior doctors' everyday practice, namely, problem recognition and problem-solving. Firstly, the literature suggests that the process of defining the problem cannot be taken as an automatic for the novice (Yanow and Tsoukas, 2009). Instead, it proposes that specific mindfulness i.e. an attentive mind and body, sitting in the present that captures clues, internal thoughts, feelings and emotions to make distinctions in the course of an activity (Epstein, 1999; Weick and Putnam, 2006), and the knowledge to interpret information as a problem (Gabbay and Le May, 2011; Norman et al., 2009; O'Neill et al., 2005), should be developed in junior doctors. For the novices to achieve these skills and knowledge, they need to consciously think about these activities and skills *while* performing them (Dreyfus and Dreyfus, 2005; Gawande, 2002), i.e. keeping these in focal awareness (Polanyi, 1962). How such mindfulness and information processing manifests in everyday work of junior doctors is relatively unexplored, and therefore represents one key objective of the study.

Second, the literature on knowledge sharing and social learning suggests that the decision and choice to use information and knowledge-seeking mechanisms during problem-solving is not straightforward in healthcare. Drawing on social learning (e.g. Wegner, 1998), and literature on knowledge sharing mechanisms (Gabbay and Le May, 2004; Ferlie, Crilly, Jashapara and Peckham, 2012; Cabrera and Cabrera, 2005), one can thus suggest that a novice can develop the required knowledge by using social and material resources (people, paper, electronics) as sources of information and knowledge. That is, doctors can be said to engage in

distinct forms of knowledge seeking behaviour (Casebeer et al., 2002; Ferlie, Crilly, Jashapara and Peckham, 2012) to develop a required knowledge in *problem-solving* processes.

However, how these resources are utilised in the midst of actions to solve the problem in hand has not been frequently studied in the healthcare sector, with the exception of work by Gabbay and Le May (2004) in a different setting. So, it is pivotal and timely to explore empirically how, when and why junior doctors use social or material resources in the *problem-solving* process in the midst of actions. Further, junior doctors are likely to need to be selective in choosing specific sources of information and knowledge to solve a given problem (Dopson and Fitzgerald, 2005; Gabbay and Le May, 2004; Huber, 1991). At present, we have little empirical evidence that shows how novice doctors do this in everyday work in a hospital setting. This study endeavours to understand these theoretical and empirical puzzles in the context of an NHS trust hospital setting, focusing on junior doctors' problem-solving. Specifically, the following three research questions guide the study:

1. How is mindfulness and information processing manifested in the situated processes of junior doctors' problem recognition during their everyday work?
2. How do junior doctors decide when and why to use social and material resources in the midst of their problem-solving process?
3. How do junior doctors work with social and material resources in the midst of their problem-solving process?

The study is based on the above discussed theoretical framework grounded in four streams of literature, namely mindfulness, information processing, sensemaking and knowledge sharing mechanism. This theoretical framework provides an analytical guide for empirically understanding the process of problem recognition and problem-solving during everyday work of junior doctors.

Considering the nature of research questions and theoretical model of the study, therefore, the empirical investigation engaged a practice lens to capture the related data (Nicolini, 2013; Sandberg and Tsoukas, 2011), i.e., to understand how junior doctor recognise and solve problems in the midst of the activities in the hospital

setting. In other words, I focused on the junior doctors' daily activities and the order in which they carry them out, the role of body and tools in accomplishing activities. Further, the interactions between junior doctors and other healthcare professionals, the purpose and nature of the interactions (face to face, telephonic etc.) and the content of the discussions (talking about the medication, critical conditions, blood reports, signs and symptoms of the disease, etc.). Given the nature and purpose of this research, a qualitative research design based on shadowing, reflective logs and interviews of junior doctors were identified as uniquely appropriate to answer the given research questions. The detail and justification of this research approach, methods of data collection and implementation of practice approach will, therefore, be presented in the next chapter.

3 CHAPTER 3: THE RESEARCH METHODOLOGY

3.1 Introduction

This Chapter addresses the issues associated with the research paradigm, approach and strategy, the research methods used to collect data and the analysis completed in order to draw conclusive findings to achieve the desired aims and objectives. A detailed discussion of the methods employed, coupled with the justification for the use of each element, is presented. Subsequently, I address the issues of methodological rigour to establish the ‘trustworthiness’ of the research findings, and I also discuss research ethics and limitations.

3.2 The aims and objectives of the study

The Chapter elucidates how and why particular research techniques were adopted, established and implemented to achieve the aims and objectives of the study. It also explains the data analysis procedure. The research methodology is “a way of thinking about studying social reality” (Strauss and Corbin, 1998, p.3) which directs me towards two aspects of the research process. First, a unique way of conceptualising the phenomenon under which the study developed from the linking and bridging of contemporary literature (as discussed in Chapter 2). Second, a systematic and organised means to investigate the phenomenon (Malterud, 2001) that is discussed and explained in this Chapter. In this study, I derived the methodology from the aims and objectives of the research (Gioia, Corley and Hamilton, 2013).

The primary aim of the research is to explore and understand the actions and processes of junior doctors that requires for developing problem recognition and problem-solving capabilities, as a key recognised feature of what makes for expert practitioners. In other words, this research work explores how we can make junior doctors mindful of context, able to collect information and clues and make sense in order to recognise and solve the arising problems in their daily work. It encompasses the influence of a range of situated social and material resources on their everyday work and on learning from experience, as I have discussed in the previous Chapter 2. I recall the use of the term ‘*social resources*’ refer to all the people resources,

members of CoP (Wenger, 1998) that are used in organisational settings. On the other hand, the term '*material resources*' demonstrates all other sources such as the use of technology to access information, database, books, protocol guidelines etc. (Nicolini, 2013). I suggest an exploratory approach to the study that is also demonstrated via the following research questions:

1. How is mindfulness and information processing manifested in the situated processes of junior doctors' problem recognition during their everyday work?
2. How do junior doctors decide when and why to use social and material resources in the midst of their problem-solving process?
3. How do junior doctors work with social and material resources in the midst of their problem-solving process?

The rationale for exploring the above-mentioned questions in the context of junior doctors echoes the importance of the actions of the junior doctors and how they think, interactions between individuals and other healthcare professionals, the available material resources in the context of practice, and internalise the utility of these resources in their practice, as identified in the Chapter 2.

3.3 The philosophy of the study

In the empirical investigation on social realities in organisational settings, researchers face an unavoidable choice between ontology, epistemology and the phenomenon of inquiry, which underpins the aims and objectives of the research project. Whether the researcher makes the selection explicitly or implicitly, these fundamental philosophical assumptions influence the decision on appropriate research methods; i.e., what is the nature of the understudied phenomenon, how can it be observed and captured, and what kind of results should one expect to find?

In relation to these underlying dimensions of the phenomenon, the primary choice has usually been constructed as one between a positivistic framework on the one hand, and interpretive and postmodern frameworks on the other hand (Hatch and Cunliffe, 2006; Chia, 1995). Positivist ontology assumes that there is one objective reality and epistemological persuasion in capturing such scientific reality. Positivist

research has bestowed an attitude of investigation that looks for ‘general theories about organisations and their members. These theories act as knowledge and powerful universal laws found in the natural sciences’ (Tsoukas and Knudsen, 2005, p. 41).

The widespread acceptance of social constructionism (Berger and Luckman, 1966) and the more recent practice-turn (Schatzki et al., 2001), have progressively challenged the positivist attitude in favour of constructivist ontology and interpretivist epistemology applied in organisational settings (Sandberg and Tsoukas, 2011; Chia, 1995). Consequently, social constructivism emphasises the significance of ‘practitioners’ lived experiences’ and social interactions in organisational settings (Knudsen and Tsoukas, 2003, p.11; Sandberg and Tsoukas, 2011). At this conjecture, several prominent scholars in the organisational study field, have suggested that pragmatism could provide an alternative way by which the research endeavour could be steered in a beneficial direction while escaping both extremes (Simpson and Lorino, 2016; Watson, 2012; Carlile, 2002; Powell, 2001; Wicks and Freeman, 1998).

More recently, pragmatism as a methodological approach has started to inspire an increasing number of organisational researchers within the study of organisational practices (Simpson and Lorino, 2016; Simpson, 2009), organisational learning (Elkjaer, 2004), organisational knowing and strategy (Powell, 2001; Cook and Brown, 1999) and change and development in organisations (Carlsen, 2006). Moreover, Wick and Freeman (1998) claim that pragmatism is an alternative methodological attitude that highlights the role of social and material resources in the epistemology of the problem-solving process by incorporating practical relevance into organisational investigations.

Based on recent developments in the field of organisation studies and the aims and objectives of the study (i.e., the study aims to explore the lived experience of junior doctors to recognise and solve the problem in the midst of action), it posits that pragmatism as a methodological approach that is able to meet the objectives of the current research project. Moreover, pragmatism is useful as a philosophical and methodological approach for studying the phenomenon of problem recognition and solving in the midst of the action, as the main focus of the research, incorporating junior doctors’ interactions with social and material resources to achieve the desired

objective and learning from experience. In doing so, phenomenon focuses on how things happen in the practical world that produce desired outcomes. Thus, I adopted pragmatism as a philosophical and methodological approach for this investigation. Next, I will outline pragmatism in more depth, and look at how it was explicitly used in this research endeavour.

3.3.1 What is pragmatism and how is it used?

Consider what effects, which might conceivably have practical bearings, we conceive the object of our conception to have. Then, our conception of these effects, is the whole of our conception of the object. Charles Sanders Peirce (1878, p. 293)

Charles Peirce is considered the pioneer of the pragmatic human thought and reasoning process which is one of the dominant strands of the American philosophical thought. The statement quoted above by Pierce advocates the knowledge and meaning of ideas vested in the actions and their practical utility in achieving the desired objectives. This attitude was after that taken up and further refined by William James, who suggested that the ‘ultimate test for us of what a truth means is indeed the conduct it dictates or inspires’ (James, 1898, p. 259). Likewise, John Dewey, who was more interested in exploring and articulating the nature of knowledge and knowing, underlines the significant aspect of knowledge as ‘an instrument or organ of successful action’ (Dewey, 1908, p. 180).

Moreover, George Mead, a co-founder of the pragmatist philosophy, mainly focuses on the social dynamics of human meaning-making and suggests that ‘the gestures of a given human organism [.....] indicate to another organism the subsequent behaviour of given organism, then it has meaning’ (Mead and Moris, 1934, p. 76 cited in Simpson, 2009). In all the conceptions as mentioned earlier of pragmatism, the most prominent link between knowledge and action advocates that knowledge/ideas are more than merely an accumulation of past experience, but rather, their significance lies in their considered utility and influence on existing and/or future experience. There is no specific ontology and epistemology in pragmatism, but the importance is always given to the idea (which may be collected from social

interactions and/or theory) that practical accomplishments produce better results. This is the idea that resonates well with the ontological and epistemological position of this research project. Because in this investigation, I am broadly looking at how junior doctors undertake an activity, how they keep themselves aware of contextual information and interpret it as a problem and then collecting related knowledge to solve them in the midst of their action to produce desired objectives and understand the complexities of lived experience and learn from it.

3.3.2 The pragmatic ontological and epistemological position

The action is the way in which human beings exist in the world and endeavour to achieve desired objectives (Joas, 2000). As indicated above, rather than the traditional choice between constructivist and realist options, the ontological position in this investigation is pragmatic in its nature (Peirce, 1931; Dewey, 1908; James, 1907). At the most fundamental level of pragmatic ontology, it suggests that experience is a primary tenant, with human beings as professional actors who can never elude from the embeddedness within the world of experiencing in which they find themselves thrown in as an actor (Elkjaer and Simpson, 2011). It is important to understand the experience as an active process of exploring reality within an embedded flux of everyday work in which cognitive aspects are just one part (Alexander, 1987). Pragmatic philosophy advocates that we as human beings are inevitably situated in an endless stream of experiencing the world that establishes our workplace conditions. “We happen to be humans existing in irreducibly human situations, located in a human world” (Pihlström, 1996, p. 17) and therefore, our likely starting point from where we may proceed in every direction of our choice, is the “world of man’s experience as it has come to seem to him [us]” (Schiller, 1912, p. xxi). Ontologically, pragmatism suggests an approach which considers the fact that human beings are living in a world where they need to act (Putnam, 1994) to achieve desired aims and objectives, i.e., by constantly keeping the end goal in sight during the inquiry. Thus, the pragmatic ontological position could be labelled as ontological experientialism (McGilvery, 1939, cited in Martela, 2015).

According to Dewey, and regarding ‘ontological experientialism’, the starting point for the pragmatic researcher is to explore engaged, organic life. The life

materialises in and by means of the environment, but the engagement is a chief parameter, and any dualism of environment and subject can only be explored by means of inquiry rather than by something that predates it (Dewey, 1938, p. 25, 33). The inquiry starts when an individual feels doubt in proceeding forward, and we find pragmatic and useful conducts to cope with life's vicissitudes (Locke et al., 2008). Dewey categorically states that no self-governing thing can stand alone without being resolved through inquiry. Similarly, Dewey suggests that theories and scientific laws are not considered as a priori truths, but rather as 'conditions which have been ascertained during the conduct of continued inquiry to be involved in its own successful pursuit' (Dewey, 1938, p. 11). Such constructive inquiry follows with time and environment in a creative and continual accomplishment of exploring new possibilities to cope with the action in hand (Joas, 1996). Hence, the position of the experiential ontology of pragmatism is the process. In other words, pragmatists are endeavoured to explore how actions, social interactions, and materials play a role in the flow and passage of events in a given time and context, which produces desired outcomes of practical accomplishment, and which resonates directly with the aims and objectives of the study.

Regarding epistemology, pragmatists conceive that all the truths are based on future-oriented 'rules of action' (James, 1907, p. 23). Because we are primarily living life in the world as actors and only subsidiarily as thinkers, cognition itself is a special form of action, which like other actions helps actors to achieve desired objectives in a specific context. Therefore, Dewey replaces the words knowledge and belief with the term 'warranted assertability' (Dewey, 1938, p. 7) to underscore the importance of the ever-progressive nature of human conviction. These warranted assertions are the result of everyday inquiry and are taking place so frequently that an actor feels comfortable enough to act upon them. However, the actor always remains open to being challenged and changed in a future inquiry.

By strengthening a specific actor's value of knowledge of the practical world, pragmatists considered the fallibilism of knowledge. Fallibilism suggests that "we cannot in any way reach perfect certitude nor exactitude" (Dewey, 1938, p. 40), or "we never can be absolutely sure of anything" (Peirce, 1931, vol. 1, pp. 147–9). Alternatively, our knowledge "swims, as it were, in a continuum of uncertainty and of

indeterminacy” (Peirce, 1931, vol. 1, p. 171). Thus, the possibility of reaching the knowledge that is the closest to the practical world (minimising the theory-practice gap) can be achieved by the pragmatist researcher.

To maintain that pragmatism is the right philosophical choice for this investigation, it is essential that ontological and epistemological assumptions echo with specific key components which define and explain the subject matter of the phenomenon under study, i.e., problem recognition and solving process (Dewey, 1933; Cunliffe and Easterby-Smith, 2004; Reynolds and Vince, 2004; Gabbay and Le May, 2011). The crucial questions here concerning the phenomenon under investigation are, ‘what are the main constructs of problem recognition and solving process?’ Moreover, ‘what are their salient properties?’ (These are explained in detail in Chapter 2).

In summary, the ability of problem recognition and problem-solving includes being mindful of contextual details and processing them as good thinking during the action (Dewey, 1933) which can be recorded through live commentary by the practitioner. The problem-solving is a process of knowledge sharing by using social and material resources; the interactions of doctors with social and material resources (knowledge sharing), which can be observations of discussions, talks and feedback during the practice (Cunliffe and Easterby-Smith, 2004; Reynolds and Vince, 2004; Raelin, 2000, 2001; Reynolds, 1998), consultation of artefacts and noticing situated clues which guide further actions. The conglomeration of thinking, interactions with social and material resources represents the problem-solving process when they produce desired outcomes. Thus, pragmatism is the most suitable philosophical position for this investigation to achieve the aims and objectives of this project.

3.4 Research approach

Charles S. Peirce, having found the limitations of the inductive and deductive reasoning processes, proposes that researchers need an alternative form of reasoning to supplement these two processes. He suggested the abductive reasoning approach for this purpose. Abductive reasoning is “the process of forming an explanatory hypothesis” (Peirce, 1903, p.216), which is also called inference to the best

explanation (Lipton, 2003; Harman, 1965). In other words, the abductive reasoning process states, “a surprising fact is observed, and this initiates a search for a hypothesis that would best explain the surprising fact” (Peirce, 1903, p. 231). In the process of developing a hypothesis and an acceptable explanation of the observed fact, the researcher considers the existing theoretical grounds and discusses with other experts in the field to infer the warranted assertion, that is equally acknowledged by the vast community of professionals from the field of practice. In such endeavour, the researcher uses her imagination to justify and reason logically with the support of existing knowledge from various social and material resources (Orlikowski and Scott, 2008; Nicolini, Gherardi and Yanow, 2003; Schatzki, 2002) resulting in an imaginative ‘conceptual leap’ (Klag and Langley, 2013). The conceptual leap should result in the best-warranted justification and reasoning of the fact at hand. Best here does not mean to be the best at objectively reasoning, but it is the best justification regarding the contextual standards of evaluations that are adhered to by the particular research community.

Moreover, this investigation aims to explore activities and processes of problem recognition and to problem-solve in the context of the doctors’ work; that is, how junior doctors may act and think in their daily practice to enhance the learning and effectiveness of their daily tasks and accomplishments. In the doctors’ practice, medical diagnosis can also be a good example of abductive reasoning. The physicians observe and record certain symptoms, compare them with their previously held scientific and practical knowledge, perhaps discuss with colleagues and/or consult books and take a further test to reach their diagnosis (Alvesson and Sköldbberg, 2009, p. 5). The induction process does not merely produce the result from the symptoms, nor by deduction from colleagues’ advice or books, but it includes a back and forth movement from theory to everyday actions to reach a conclusion. Similarly, in this research, I observed the practices of junior doctors and then moved from empirical data to a theoretical explanation of the material gathered, and phenomena observed that warranted reasoning. In other words, this research is based on an abductive research approach. Moreover, the study intended to explore the lived experience of junior doctors’ in an organisational context, which requires a case study method of inquiry (Yin, 2014).

3.5 The case study research strategy and methods

The qualitative case study research strategy enables the researcher to explore and investigate contemporary issues in real-world professional settings with the help of several available sources of data (Yin, 2014). Similarly, Kumar, Stern and Anderson (1993) argue that if the research is attempting to explore a complex phenomenon, such as situated thinking and actions associated with problem recognition and problem-solving in everyday work, a qualitative case study is best suited for this purpose. The focus was on how junior doctors engage with everyday work to recognise and solve the everyday problems in the flux of the activities. Specifically, how junior doctors maintain mindfulness to realise the problem in action and how they solve the problem by using organisational context and social and material resources. Although some of these issues were examined in the seminal works 'Making doctors' (Sinclair, 1997), 'Medical talk and medical work' (Atkinson, 1995) and 'The Reflective Practitioner: How Professionals Think in Action' (Schön, 1983). The study extends our understanding by appreciating the real work actions, interactions with social and material resources (knowledge sharing) and thinking of junior doctors in a hospital setting that enable them to solve the problem in the midst of action.

Previously, Glaze (2001) used a qualitative case study to explore the perception of reflective practice and its practice in postgraduate nursing. In his case study, he collected data through the shadowing and interviews of the nurses, in order to explore the effectiveness of the training module of nursing. Similarly, Gustafsson and Fagerberg (2004) investigate how nurses deal with their reflection and on what they reflect more frequently in the context of the Finnish healthcare system to solve the problems. Moreover, there are much research works available that used qualitative case studies in exploring the influence of different aspects of reflective practice on the health sector, such as those by Klemola and Norros (1997), Niemi (1997), Boenink et al. (2004) and Pearson and Heywood (2004). This research project explores the under-researched area of the contextually embedded thinking and actions linked with problem recognition and problem-solving. Thus, I implemented a qualitative case study as a strategy to explore the conceptual and practical intricacies of these phenomena and how they are integral to the daily practices of junior doctors.

3.5.1 Theoretical matching of research case and site

The selection of junior doctors in the NHS hospital setting was based on following the theoretical and practical guidelines indicated in the theoretical sampling technique (Locke, 2001). The rationale for theoretical sampling was derived from my commitment to developing the theoretical and empirical understanding of problem-solving in the midst of practice, and this commitment set the provisions to select the sample. As noted previously, to observe and see how social and material resources may help doctors in problem realising and solving problems in everyday work. It was essential that an organisation should have an open-door policy, availability of specific sources of knowledge and employees are endeavouring for group assignments or group responsibilities (Raelin, 2001), as with a hospital working framework (Gherardi and Rodeschini, 2016). It facilitates social interactions, and collective dialogues and employees may be able to organise their actions in a more effective manner (Vince, 2002). The NHS doctors' work exhibits the best example of an open-door policy, availability of a range of databases to facilitate their practice and the whole department is working to provide the best possible healthcare to the patients. On the other hand, despite the established significance of problem-solving in the development of doctors, there is a dearth of such research which empirically explores the process of developing the capabilities of problem-solving in junior doctors. Such a process is embedded in the hospital context with an aim to explore the phenomenon as a social and material practice.

In the hospital setting, I used the theoretical sampling technique (Lock, 2001; Yin, 2014) and selected the junior doctors because they face more problems in their mundane job and more frequent opportunities to capture the thinking and process by which they recognise and solve the problem in the midst of practice. The junior doctors (specifically foundation trainee doctors and core trainee doctors) are a real source of valid information regarding problem identification and addressing them. As stressed previously, the rationale for choosing junior doctors is threefold. Firstly, it has been witnessed that training doctors commit more mistakes (Millwood, 2014) and there are therefore more events of problem realisation and associated actions to be observed and to discuss the application of thinking to cope with such mistakes and errors. Secondly, Mamede et al., (2007) establish that the use of reflective practice

and reflective decision-making decreases with the experience of the doctors. Mamede and colleagues argue that it is difficult to capture thinking and actions in senior doctors because their decisions and actions become more spontaneous with the experience. Finally, junior doctors also have to reflect as part of their training in a structured way in their electronic portfolio (GMC, 2009). Thus, the case of a junior doctor provides a fertile ground to explore how these doctors utilise social and material resources in order to achieve desired outcomes in the hospital context.

I selected one of the most prominent Foundation Trust Hospitals in the National Health Service (NHS) deanery – the North West of England. NHS North West deanery covers a geographical area from Leighton to Barrow from the south to the north and Isle of Man in the west. It provides nearly 1800 foundation training posts for every working year, which makes it the biggest foundation school in the United Kingdom (Health Education North West website).

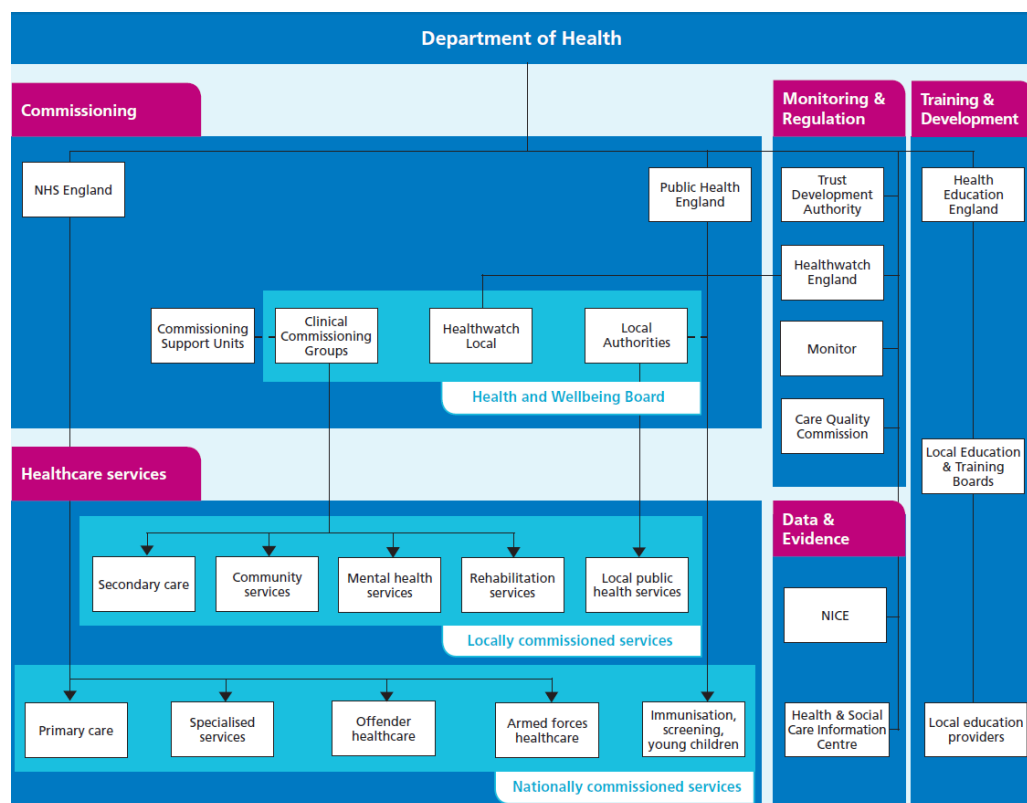


Figure 3-1: Department of Health, and NHS England organogram (taken from NHS England, 2014)

The selection of the deanery was based on how convenient it was to get the sampling approved by the NHS Research Ethical Committee. Deanery to deanery

there is not much difference in the context of practice because the rules and policies, tools and technologies used by doctors are relatively similar as evident in Figure 3.1 showing the organogram of Health department of United Kingdom. NHS England provides various healthcare services, in which trainee doctors undertake most of their training in secondary care (trust hospital) and primary care. The specialised services, as shown in the organogram, are used for the training of speciality levels 1 and 2. In every trust hospital, the quality of the services provided to the patient is monitored by the Care Quality Commission. The Care Quality Commission assesses the performance of the medical services provided by doctors, about NICE guidelines and protocols, and health and social care regulations, as shown in figure 3.1. The research design of the study consists of seven interrelated steps, which inform each other as shown in Figure 3.2. In the rest of the Chapter, I discuss all the steps and their rationale in detail.

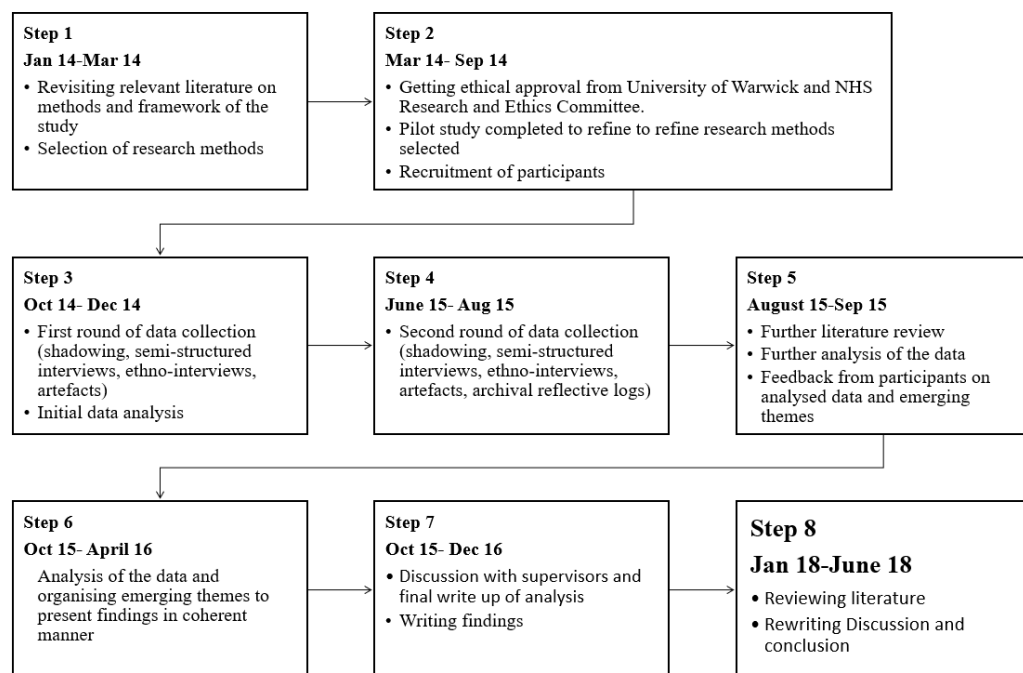


Figure 3-2: Research design

3.5.2 The research methods

In order to investigate the activities and processes junior doctors are mindful of during the problem recognition and use of social and material resources in solving these problems, particularly in healthcare, a number of research methods have been

employed. Nevertheless, five methods are most frequently employed to explore professional practices, how professionals do their work and think and act. These methods include shadowing (structured/semi-structured observation and unstructured observation), interviews, diaries and logs of reflection, secondary sources and questionnaires (e.g., Gustafsson and Fagerberg, 2004; Mamede and Schmidt, 2004; Klemola and Norros; 1997, 2001; Teekman, 2000).

There are many examples which used observations/shadowing, reflective logs, interviews and artefacts in their research to explore the various aspects of professional thinking (Boenink et al., 2004; Gustafsson and Fagerberg, 2004; Klemola and Norros, 1997; Niemi, 1997; Pinsky and Irby, 1997;). It indicates that, in order to capture the process of problem recognition and to manage them, i.e., the conglomeration of thinking, physical actions, and interactions with social and material resources, one should consider shadowing, interviews, archival reflective logs and artefacts as the most suitable methods to use in an empirical setting. Methodologically, this research work bears most resemblance to the classic works “mindlines” (Gabbay and Le May, 2004), ‘Medical talk and medical work’ (Atkinson, 1995) and ‘The Reflective Practitioner: How Professionals Think in Action’ (Schön, 1983). They used case studies, using observations, artefacts and theoretical justification for their concluding remarks. Similarly, Sandberg and Pinnington (2009) explored the knowledge and knowing of the corporate lawyers to articulate their competencies coherently with a case study approach. They used the shadowing of corporate lawyers in a large Australian law firm for three weeks, performed interviews (n=22) and collected relevant artefacts as a data source.

To meet the objectives of the study by keeping in mind the resources available (time, financial resources, and availability of access to sites and participants), ensuring the suitability of methods to capture relevant data on what and why junior doctors do what they do, and consider how saying and doing, interaction orders, tools and artefacts and practical concerns merge in everyday activities of junior doctors. I selected a combination of three suitable methods. These are shadowing, interviews and secondary sources of data (archival reflective logs, and artefacts).

3.5.3 Shadowing

Shadowing is a technique that requires a researcher to follow the research participant closely during her work in an organisational setting over a suitable period. In the shadowing process, when the junior doctor goes to see the patient, uses the computer in the doctors' office, talks to a colleague in the corridor, has lunch, or talks briefly with other team members, it should all be recorded and followed during the time the person spends at work (McDonald, 2005). The shadowing method is considered as an effective tool to capture the behaviour, activities, and social structures in the workplace. Therefore, the shadowing method was selected for this research work. In the shadowing process, the researcher is recording information, consider the analogy of the 'miner's helmet with light'. As "when they [actors] talk, the light shines on the actor being shadowed and as they are walking the light shines out in front, lighting the way, showing the path through the organisation, but it also sweeps around the organisation as the researcher turns her head with curiosity (McDonald and Simpson, 2014, p. 13). Therefore, shadowing can capture the junior doctors' actions, talks, discussions, the utility of resources, use of computers and books etc.

Moreover, shadowing is a technique best suited to capturing how junior doctors' thinking is entwined in the practice because shadowing facilitates researchers in "articulating their stream of consciousness, their thoughts, feelings and emotions while they actually go about the activity being studied" (Burgoyne and Hodgson, 1984, p. 163). The investigator is openly exploring the phenomenon in a particular context and can ask questions to the actor she follows to collect data on a "relatively large proportion of unobservable, abstract intellectual activity" (Martinko and Gardner, 1985, p. 683). So, during shadowing, the researcher is not only getting benefits by being able to access the espoused theories of the individual but is also capturing the 'theories in use' by the research participants during everyday work. That is why a number of research works used shadowing, particularly in the study of problem-solving and reflective practice (Gustafsson and Fagerberg, 2004; Klemola and Norros; 1997, 2001; Kolb, 1984; Schön, 1983), and practice studies (Nicolini, Powell and Korica, 2014; Nicolini, 2011, Nicolini, 2009; Orr, 1996;).

Additionally, shadowing is intended to produce a selective dataset. The researcher does not control this selectivity, nor by the actor, instead it is defined by

the activities and movements in the organisational context that are bound by time and space. In other words, wherever the mundane activities take the actors, the researcher is bound to follow. This feature of the shadowing method yields a more grounded, less biased dataset that is required for my research to study the activities and processes during the junior doctors' everyday work. Shadowing can be done over sequential or alternate days over a single day to months, according to the agenda of the research (McDonald, 2005). The shadowing method is an effective tool to capture behaviour, activities, and social structures in the workplace. Therefore, the shadowing method was employed as the primary source of data for this research work.

3.5.4 Interviews

It would seem that asking doctors how they solve the problem and improvise in daily practice is the simplest way to learn about the phenomenon for the researcher, if it had not already been established that professionals know and do much more than they realise (Argyris and Schön, 1978; Bourdieu, 1977; Polanyi, 1962). Mintzberg (1973) empirically investigate the managerial work and argues that when we ask managers in interviews what it is that they do, they tend to focus on the abstract or espouse theories of the practice, and consciously or unconsciously overlook the real-world complexities of their work and context.

However, when combined with other methods such as shadowing, interviews are considered as a useful tool for endowing a broad understanding of everyday work and the phenomenon that is embedded in the real world (Marshall and Stewart, 1981). More recently, interviews have been effectively used in social sciences, management science and practice studies (Nicolini, Powell and Korica, 2014; Nicolini, 2009; Sinclair, 1997; Orr, 1996). In this study, I selected semi-structured interviews to supplement the data collection, besides using the shadowing (semi-structured observations) as the primary source of data collection method.

The semi-structured interview is a well-known method used in social sciences research. A semi-structured interview is based on open-ended questions, allowing new ideas and categories to emerge with no particular sequence of questioning being followed. The semi-structured interview is framed on the central themes and

categories of the problem-solving process to be explored (Kvale and Brinkmann, 2009).

3.5.5 Secondary sources of data

The artefacts are considered as important features of professional practice to understand the practical accomplishments of professionals in the organisation (Nicolini, 2011). Moreover, organisational policies and guidelines have a deep-rooted influence on professional actions (Bourdieu, 1991; Lave and Wenger, 1991). The artefacts used in daily practices, memos, general practitioners' reports, blood reports, x-rays, etc. play a significant role in constructing the practice and knowledge of the doctor. To achieve the aim of the study to capture the interaction with social and material resources embedded in the everyday activities of junior doctors, I need to explore how junior doctors' practices unfold, and spontaneous improvisation emerges in the day-to-day activities. Moreover, I also need to understand how organisational, social and material resources such as teamwork, interactions with colleagues, rules and regulations, protocol guides, ethical guidelines, etc. influence doctors' thinking and actions in managing difficult situations. I opted to collect the artefacts and policies, guidelines and protocols to make sense of the junior doctors' practices in a given situation.

Furthermore, in the research of management study and particularly in the domain of how doctors are thinking, reflective logs are effectively used to understand the espoused thinking process or reflective thinking of practitioners. Maintaining a reflective log is an essential requirement of the NHS as part of a doctor's training. These reflective logs provide relevant information regarding "subjective experiences, thinking, behaviours and social interactions linked to a temporal framework" (Thiele, Laireiter and Baumann, 2002, p.3). Thus, in this study reflective logs were also used to facilitate the understanding of junior doctors' thinking. I was able to collect more than 300 reflective logs from ten junior doctors, who had maintained these for a period of the last six months. Each participant junior doctor maintained her reflections in their e-portfolio as a requirement of her training. It provided me with information on how junior doctors think in practice, and how they reflect on their practice to solve their problems. Most importantly, I looked at the supervisors' views on the junior

doctors' thinking and actions, which I used to deduce a better way of thinking and to perform in a particular situation.

3.6 Research process

In this part of the Chapter, I discuss the process of getting access to an NHS trust hospital, ethical approvals from relevant authorities to commence the research work, the selection of research participants and data collection in the field.

3.6.1 Getting access to an NHS trust hospital

Ethical approval was obtained from the University of Warwick on 4th March 2014. The research work was related to the practices of doctors only and did not involve contacting or interviewing patients, children, or adults lacking the capacity to give consent themselves. It indicates that the study did not require a review/approval from the NHS Research Ethical Committee, and only required approval from the NHS Research and Development (R&D) office to use an NHS site for academic research work. I prepared the application to obtain approval from the NHS R&D office of the selected foundation trust hospital at the end of March 2014. This application was comprised of a protocol guide, a participant information sheet, a participant consent form and an insurance document for the security of the researcher and the participants. It took about a month to get the first response from the Research and Development Director of the NHS trust hospital. She advised some minor changes to the research protocol and data collection method, such as decreasing the number of potential participants, and for the shadowing, I needed occupational health clearance, and a criminal record check (CRB) before I could start the data collection. I edited the protocol and data collection with the guidance of academic supervisors and received processed CRB and occupational health clearance from the University of Warwick in almost one month in June 2014. Subsequently, I sent all the documents to the R&D Director, in July 2014. The R&D Director invited me to meet her to discuss the research and brief on the shadowing process.

Furthermore, there was a challenge to find a site supervisor who would take responsibility for the research conduct and supervise me at the NHS site. During this period, I kept on searching for a site supervisor by using some of my contacts with

family and friends and succeeded in convincing the Director of the Foundation Training programme to supervise me in the data collection process on site. In the last week of August 2014, I submitted all the required documents to the NHS R&D office with a supporting letter from the site supervisor. Finally, the NHS R&D office gave me a formal access letter on October, 14. All the names of the participants and the organisation were anonymised for confidentiality purposes.

3.6.2 Recruitment of participants

Before the data collection began, I read extensively about the NHS training system and the pre-requisites of getting into the training programme. It includes reading the archival records of various published autobiographies of junior doctors in the BMJ, regular interactions and discussions within trainee (junior) doctors. I was able to extensively interact and have discussions with junior doctors because of two main reasons. Firstly, I have a very close friend and family members who are doctors, and I actually lived with a junior doctor. This helps me to get a rough idea of how doctors think, and what challenges they face during their training programme. One of the challenges, is how they utilised social and material resources in their daily practice to be active and efficient doctors? Secondly, my interests lead me to socialise with doctors, and because I have been going to the hospital daily to pick up my friends and family for last three years, the context feels familiar to me. Because of all this background work, I was aware of junior doctors' general routine, how their shifts work in different departments, and what a junior doctor strives to learn, etc. This is the background work I was involved in before I started my fieldwork.

After obtaining ethical approval from the NHS trust hospital, I was able to convince the Training Director of the trust hospital to act as my site supervisor. It helped me to gain initial entry into the hospital setting. Before I started my fieldwork, I had a comprehensive meeting with the Training Director of the trust hospital. During this meeting, the Training Director offered to let me give a short presentation in the junior doctors' weekly training session so that they would all know and become familiar with me. It was an excellent opportunity for me to get the consent of the participants. It was vital because I presented the research process and objectives to the whole audience and described what each participant should expect if they wanted to

participate. From this presentation (07-10-14), six junior doctors readily volunteered to participate in the research. At the same time, I gave them printed participant information sheets and consent forms and took their contact details to finalise the day and time for the interview and shadowing.

I kept in contact with these six participants and requested that the site supervisor personally email the participant information sheet and the consent form to all the trainee doctors. During my communication with the current six participant junior doctors, we were able to select dates and times for the shadowing and interviews for the first six participants (D1- D6).

Now I will look at what I was planning to get out of the shadowing of junior doctors. The research aims to explore the use of social and material resources in the daily practice of junior doctors which influences the outcomes of their actions. It required that first I should be familiar with the context. The context includes the use of different tools and technology, social interactions, who interacts with who, why they interact, what they talk about and how these talks influence the future actions and thinking of the junior doctors. Initially, I planned to record all the daily practices of junior doctors, and all the practices of another associated healthcare professional who in some way or other, influences the junior doctors' practice. During the first five days, I became familiar with the daily routines of the junior doctors in two departments (which were the targets for the data collection) namely, the Acute Medicine ward and Accident and Emergency ward. I selected these two departments in particular because the Acute Medicine ward and the Accident and Emergency ward provide the junior doctors with diverse kinds of challenges and problems in a mundane job. If there are more opportunities to face challenges and problems, there must be more possibilities for me to record the junior doctors' thinking, interpretations, and actions.

Before actually going to the hospital setting to shadow, I arranged the dates and communicated them with the participant. It was only six participants, and shadowing was planned for 15 days from 18-10-14 to 04-11-14. I started shadowing D1 from 18-10-14 and also established social relations with other junior doctors to recruit them for my research. Shadowing of D1 and D2 went as planned, but D3 went on

compassionate leave after the first day of shadowing, due to personal reasons. It was a worrying sign for me because until then, I had not been able to find other participants. On the 27-10-14 I received an email from a junior doctor in response to the email that was forwarded by my site supervisor (Training Director) on my behalf. She asked about the participation process and what would be the benefit to her if she participated in the research. At that time, I communicated with D1 and asked her if I could refer to her in a discussion about benefitting from learning how to solve the problems in practice. It helped, and I told her that it depends on you, but you can ask D1 about what I do during the shadowing process. It is exactly like a medical student being attached to you and asking basic questions about the different things you do in your daily routine. She was therefore happy to participate in the research.

Similarly, I was able to recruit three more participants during my shadowing of the six participants, making 10 in total. The recruitment of the participants was very challenging, particularly for the shadowing. Then in a similar vein, I was able to recruit six more participants when shadowing and socialising with other junior doctors. I shadowed these 16 doctors for a total of 30 days. After the first round of data collection, I kept in touch with all the participants in the informal meeting and by attending the informal get together of the junior doctors, with the help of the social relations that had developed in the shadowing process.

In the second round of data collection, I felt that I needed more data to actually focus my observations on recording the events, on the specific process of the junior doctors' practice and on what kind of help social and material resources provide to junior doctors. For this purpose, I was now aware of many junior doctors in the trust hospital and was also familiar with junior doctors who were known to be very good in the social settings of the hospital. I deliberately approached 14 such 'high-performing' doctors with the help of friends and family who work in the hospital (during June 2015). In this process, I was able to recruit four participants very quickly successfully and started shadowing from the end of June 2015. During the process of shadowing, I continuously engaged myself in social activities and focused on getting more participants because now, I was able to collect very concise data, specifically related to the junior doctors' thinking and interaction with social and material resources in the midst of the action. In this struggle, I was able to recruit four more junior doctors,

giving another eight in total. Of these eight participants, there were only two doctors from the foundation training level and six from the core training level. The foundation training program is two-year training of graduate doctors straight after medical school. After completing the foundation training program, the core training program starts that lasts for three to five years on the job training). I stopped recruiting more participants, as I began to find that relevant data was being repeated (Glaser and Strauss, 1968) in terms of the social and material resources used in problem-solving.

In total, I recruited 24 junior doctors, shadowed them for 45 days of which 22 were also interviewed (List of participants is shown in table 3.1). In this process of socialisation with the participants, I was also able to collect the reflective logs of the junior doctors. These logs are an official requirement of the NHS training system. The reflective logs coupled with my shadowing data provided me with a very rich database of difficult situations that junior doctors face in their daily practice and information on how they sort these problematic situations with the help of social and material resources. The use of reflective logs in this research was not merely focused on the cognitive learning of the junior doctors; it also provided me with data on what they did in a particular situation. Here I mean that in reflective logs, the junior doctor also explains what happened in a particular situation. It is a narrative account of using artefacts, discussion with colleagues, what helpful information came from artefacts and social interactions and how it modified their future actions or will guide future actions. These logs provided me with nearly 300 examples of critical events that junior doctors faced in their daily routine.

Table 3-1: List of the participants

	Location/department	Training stage-Gender	Date of Observations	No of hours	Day of Obs	Interviewed
D1	A & E Department	FY2-M	18/10/2014	08 hrs	1	Yes
D1	A & E Department	FY2-M	19/10/2014	08 hrs	2	
D2	Acute medicine ward	FY1-F	21/10/2014	08 hrs	3	Yes
D2	Acute medicine ward	FY1-F	22/10/2014	08 hrs	4	
D2	Acute medicine ward	FY1-F	23/10/2014	08 hrs	5	
D3	Acute medicine ward	FY2-F	24/10/2014	08 hrs	6	Yes
D4	A & E Department	FY2- F	27/10/2014	08 hrs	7	Yes
D4	A & E Department	FY2- F	28/10/2014	08 hrs	8	
D5	Acute medicine ward	FY2-F	30/10/2014	08 hrs	9	Yes
D5	Acute medicine ward	FY2-F	31/10/2014	08 hrs	10	
D6	A & E Department	FY2-M	03/11/2014	08 hrs	11	Yes
D6	A & E Department	FY2-M	04/11/2014	08 hrs	12	
D7	Acute medicine ward	FY1-F	05/11/2014	08 hrs	13	Yes
D7	Acute medicine ward	FY1-F	06/11/2014	08 hrs	14	
D8	Acute medicine ward	FY1-F	07/11/2014	08 hrs	15	Yes
D9	Acute medicine ward	FY1-F	10/11/2014	08 hrs	16	Yes
D9	Acute medicine ward	FY1-F	11/11/2014	08 hrs	17	
D10	Acute medicine ward	FY1-M	12/11/2014	08 hrs	18	Yes
D10	Acute medicine ward	FY1-M	13/11/2014	08 hrs	19	
D11	A & E Department	FY1-F	14/11/2014	08 hrs	20	Yes
D12	Acute medicine ward	FY2-M	17/11/2014	08 hrs	21	Yes
D12	Acute medicine ward	FY2-M	18/11/2014	08 hrs	22	
D13	Acute medicine ward	FY2-F	19/11/2014	08 hrs	23	Yes
D13	Acute medicine ward	FY2-F	20/11/2014	08 hrs	24	
D14	Acute medicine ward	FY2-F	21/11/2014	08 hrs	25	Yes
D15	Acute medicine ward	FY2-M	23/11/2014	08 hrs	26	Yes

D15	Acute medicine ward	FY2-M	24/11/2014	08 hrs	27	
D16	Acute medicine ward	FY2-M	25/11/2014	08 hrs	28	Yes
D16	Acute medicine ward	FY2-M	26/11/2014	08 hrs	29	
D16	Acute medicine ward	FY2-M	27/11/2014	08 hrs	30	
D17	Acute medicine ward	FY2-M	27/06/2015	08 hrs	31	
D18	Acute medicine ward	CT1-F	28/06/2015	08 hrs	32	Yes
D18	Acute medicine ward	CT1-F	29/06/2015	08 hrs	33	
D18	Acute medicine ward	CT1-F	30/06/2015	08 hrs	34	
D19	A & E Department	CT1-F	01/07/2015	08 hrs	35	Yes
D19	A & E Department	CT1-F	02/07/2015	08 hrs	36	
D20	A & E Department	CT1-F	04/08/2015	08 hrs	37	Yes
D20	A & E Department	CT1-F	05/08/2015	08 hrs	38	
D21	A & E Department	FY2-M	08/08/2015	08 hrs	39	Yes
D22	A & E Department	CT1-F	10/08/2015	08 hrs	40	Yes
D22	A & E Department	CT1-F	11/08/2015	09 hrs	41	Yes
D23	A & E Department	CT2-M	15/08/2015	08 hrs	42	
D23	A & E Department	CT2-M	16/08/2015	08 hrs	43	
D23	A & E Department	CT2-M	17/08/2015	12 hrs- night	44	
D24	A & E Department	CT2-F	20/08/2015	08 hrs	45	
				365 Hrs		22 Interviews

3.7 Data collection

3.7.1 The shadowing process and data recording

I shadowed 24 junior doctors in Acute medicine ward and Accident and Emergency department for a full 45 days. Though, collecting rich data which enables me to understand various nuances of junior doctors' embedded reflexivity in their real work was a challenging task. In order to capture the relevant data, firstly, I used the practice lens to understand the daily routine and the contextual social and material

resources involved in realising the arising problem in the activities and utilising social and material resources in accomplishing their tasks. As previously mentioned, I used Nicolini, (2013) as a guide to capturing the practice of junior doctors and understanding the context of practice, i.e., in hospital settings. I mainly focused on the following in the first round of shadowing:

- Daily activities and the sequence in which junior doctors perform them (e.g., ward rounds with/without a senior, patient management and follow-ups, investigation tracking, note-taking).
- The role of body and tools in accomplishing and making sense of activities.
- Which artefacts were used and the way they were used.
- Junior doctors' meetings and talks with other people and the purpose of interaction.
- Whether these conversations and meetings were voluntarily organised or were an essential part of the practice?
- How other people were selected (or came into the practice) to talk and discuss in the mundaneness of practice (clarify the political features of practice).
- The content of discussion (e.g., talking about medication, critical conditions, blood reports follow-up, behaviour, signs and symptoms of the disease, etc.).

These points of focus alone are not very useful in achieving the objective of data collection because the problem-solving process also includes an important aspect of thinking and interpretation of the situation; i.e., how junior doctors think in the midst of their practice. Therefore, I need to know and present data on what junior doctors infer from dialogues, interaction with artefacts and observations of the context. For this purpose, I ask the junior doctors to verbalise what they are doing and why they are doing it. In other words, to capture junior doctors' thinking during all

these activities, I conducted ethnographic interviews at the same time to ‘articulat[e] their stream of consciousness’, their thoughts, feelings and emotions while they actually go about the activity being studied” (Burgoyne and Hodgson, 1984: 163). For example, if the junior doctor looked in the system for a particular set of blood reports or x-rays, I asked, ‘what do the blood reports/x-rays tell you about the patient’s condition?’

Similarly, if a junior doctor moved to enter into the discussion with a colleague or senior fellow, I enquired about what made them initiate the discussion with others, and what was the confusing or discomfoting thing that motivated them to talk to others? Initially, when I started the shadowing, it was quite tricky because I felt that I was disturbing their practice with such questions. However, soon, I observed that there was a doctor who was doing a clinical attachment. The junior doctor was telling her everything she was doing and why she was doing it, and verbalising to the clinical attach  about how she thinks in practice. This observation, therefore, made my task bit more comfortable, as now I could take the stance that she just considered me as a clinical attach , given I wanted to know what to do and why. That is, I also implemented a ‘think aloud’ technique (McDonald and Simpson, 2014). Thus, during shadowing, I was recording junior doctors’ interactions with artefacts and colleagues and patients, and also what they were observing when examining the patient and how they were making decisions (McDonald and Simpson, 2014).

Moreover, I explored the standards of excellence that accentuate good and bad practice; this was done by examining the policies and rules and regulations of the assessment of the doctors’ performance (artefacts and online resources) and their embodied practice by junior doctors. It gave me insight into the important aspects of the everyday work of junior doctors and how juniors’ doctors’ practice can be evaluated in their own professional context.

In order to capture the junior doctors’ difficult moments (surprises) in practice, I used ‘practical rationality’ (Sandberg and Tsoukas, 2011) to capture the logic of practice and to record the process involved in response to these events consciously. I explored the junior doctors’ responses to 1) thwarted expectation - action is disturbed due to unanticipated outcomes and/or standards of excellence are not met; 2) the

emergence of deviation when a new discourse item was introduced, or new actions appeared; and 3) operations being temporarily disturbed as the practitioner realised the new ways of 'doing.' Thus, by focusing on the different aspects of everyday work and using multiple lenses to capture the data, I was able to record a description of the problem-solving process that occurs in the midst of junior doctors' practice, with the help of social and material resources.

In the first round of data collection, I was convinced that social and material resources greatly influenced the actions of the junior doctors associated with the problem-solving process, and I have much evidence to support this assertion. However, still, I felt that I needed more specific incidents where social and material resources clearly modified junior doctors' actions and thinking. Thereby, in the second round of data collection, I mainly focused on the recording of events, which included the use of dialogues, artefacts, internet sources and books to reach the decisions associated with patient management. In the second round of data collection, my familiarity with the context and focus of shadowing thus helped me to capture numerous examples of the junior doctors' problem-solving with the help of social and material resources in an activity.

3.7.2 Note-taking and recording data

On the first day of my shadowing, I tried to record everything that I saw and listened to. However, it seemed that this was not possible because the junior doctors' work is not about sitting at a table and working; most of the time they walk around and use different tools to accomplish their tasks. Therefore, I very quickly decided to record important aspects of their practice in shorthand writing and I was quick and confident enough to record data in my native language. I, therefore, recorded my shadowing in my native language, and I recorded the jargon and the doctors' discussions in English. I was initially not allowed to use voice-record due to confidentiality issues and the involvement of patients' personal details. Therefore, I recorded all the data by using shorthand, and I also recorded my own voice memos, narrating what I saw. The written notes also included the talk and discussions between the junior doctors, nurses and other doctors, both face-to-face and on the telephone. I took notes of all these discursive aspects of junior doctors' practices.

On the sixth day of shadowing, D3 told me that they do record themselves inpatient consultation but that the recording is only allowed on the hospital iPad so that data remains secure and can be safely destroyed after being used in teaching. I asked for more detail from D3, and she told me that I might be able to get information about using the iPad for my research. I spoke to the Training Director, and she told me that the employees of the hospital could only use the iPad and that data only stays on the tablet for a few days, as it has limited memory space. The Training Director also told me that she would discuss this with the trust hospital's Director of Research. I continued to take notes in the same manner, and I only recorded the discussions taking place there and then in the hospital setting. After three days, I again asked about the use of the iPad, but the Training Director refused by saying that it is only for the use of trainee doctors and could not be issued by outsiders.

Every day, when I came back from shadowing, I extended my paper notes and wrote the narratives and stories of different events, with the help of shorthand notes and my voice memos (Marshall and Rossman, 2014). When I extended the notes, I tried to keep my observations (what was actually happening), ethnographic discussions (the questions I ask during the shadowing and junior doctors' explanations) and my interpretations separate, to aid me in the data analysis. During this process, I shadowed 24 junior doctors in two departments, namely, the Acute Medicine ward and the Accident and Emergency department for 45 days and developed extensive field notes totalling 419 typed pages. These extensive notes provide information about 1) the context of junior doctors' acts; (2) the intentions and meanings that junior doctors attach to their actions; (3) the evolution and development of the junior doctors' acts; and (4) the action as a text that can then be interpreted. I have attached one-day observation notes in Annex 1 for example.

3.7.3 Semi-structured interviews

In this study, as mentioned above, there were two rounds of data collection, and so there were also two rounds of interviews. In the first round of data collection, I held 16 interviews with junior doctors. In these interviews, I collected data regarding how junior doctors solve various types of problems and also asked them to provide examples of reflection on critical events. In the second round of interviews, I

interviewed six junior doctors. These interviews were mainly dedicated to exploring two main aspects of problem-solving. The interview protocols are slightly different and are attached in Annexe 1.

First, semi-structured interviews focused on getting information regarding two aspects that are related to the problem-solving of junior doctors. It was about how junior doctors understand the emerging problem and what is the espoused theory of junior doctors' use to solve the problem in hand? For this purpose, open-ended questions are used, such as, what is the problem-solving process? How do you think the e-portfolio helps with your learning? How do you prepare a good reflection to write in your e-portfolio? (Complete protocol guide is attached in Annexe 2)

Second, how junior doctors get prepared to approach the professional world and what are their learning objective from experience. This includes asking about the formal training, discussion of training curriculum, and their aims and objectives. Further, I focused on exploring the daily routines of the activities of the junior doctor. I also talked about how social interactions help them in performing their tasks from day one in difficult situations, how they come to know about behaviour, style, attitude and other professional norms, all of which facilitate them to perform and act according to the standards of the NHS.

The interviews were conducted ahead of the observations and were conducted in person. All the interviews were recorded by taking notes, and generally, they were all about developing an understanding of what junior doctors actually think about the problem-solving process. In the second round of interviews, I did not focus on the reflective examples in the interview because at this stage I was able to collect the archived record of the reflective logs, which provided exactly the same kind of data for the study. In this round of interviews, my chief objective was to understand the aims and objectives of the junior doctor when practising in a hospital setting. Moreover, I also aimed to develop a rapport with the participant and to overcome the observer's effect on the participant's practice (Patton, 2005). This was essential to my research because the main objective of the shadowing is to uncover problematic situations and to look at how junior doctors handle them reflectively.

3.7.4 Secondary sources

The NHS United Kingdom, together with many other countries, has a compulsory requirement for trainee doctors to maintain their reflective logs, to present critical incidents and learning from them. All these reflective logs are maintained in the personal electronic portfolio, on which junior doctors undertake a written reflection on important learning incidents. The significance of these written reflections, for junior doctors, is vested in getting advice on how to think, behave, act and represent their reflection from their supervisors. With my personal efforts, I was able to collect more than 300 reflective logs from ten junior doctors participating in the research as a secondary source of data on thinking during the practice of junior doctors. Each reflective log represents the entries for a period of the last six months. It provided me with information on how junior doctors think in practice, the actions, social interactions and material used in the reflective process and how they reflect on their practice. Most importantly, what are the supervisors' views on the pattern of junior doctors' thoughts and actions?

These reflective logs provided very useful data to help articulate how junior doctors think about critical events and manage the situation. Moreover, it helped me to understand the cognitive difference between individual problem-solving processes (reflective writing) and social and collective reflective practice. Individual problem-solving appeared to involve retrospective reflective thinking, which mainly focuses on previous experience and/or explicit knowledge of the junior doctor. On the other hand, in the problem-solving with situated interactions with social and material resources, junior doctors tend to think prospectively, which mainly focuses on who can rescue them in a particular situation, and from where they can get more accurate and related information to guide their medical decision.

I also collected other artefacts and policy guides those appeared to be helping junior doctors in problem-solving. These include the artefacts that doctors use, policies and ethical guidelines that shape their behaviour in the workplace and junior doctors' training curriculum, which conveys the aims and objectives of their practice and relates them to the different aspects of everyday practice. I was not able to collect examples of investigations, even those that were not very important for the research purpose. On the other hand, there were many sources, such as online databases and protocol guides, which I made a record of and used in the data analysis. These

facilitated the analysis by providing me with information on what clues junior doctors take forward and reflect on to make an effective decision.

3.7.5 Complications in the data collection process

There were two particular aspects of the data collection process, where it was challenging to collect relevant data. First, a good rapport was needed to shadow and interviewing junior doctors and discussing their problems with them, so that they are open to expressing their feelings and experiences. Second, the recording of field notes was difficult, as junior doctors kept walking around the whole hospital to accomplish their task, communicating with other colleagues on the phone and entering into the discussion in the teaching sessions. Moreover, other challenges in data collection methods include the general physical and mental tiredness inherently associated with observation methods.

As mentioned in the data collecting section, I worked extensively to build a rapport with the participants and familiarity with the context. To recap, before undertaking the shadowing and the interviews, I made myself familiar with the NHS training system through literature, frequent visits to the hospital and repeated interactions with junior doctors to facilitate relationship building and closeness so that they would not be bothered by my presence at their workplace. During initial interactions, I tended to talk about workplace difficulties and challenges faced by junior doctors. Through these discussions, I tried to make the junior doctors realise that I am aware that mistakes caused by junior doctors do not indicate that they are bad doctors and that the most important part of the junior doctors' job is how they manage problematic situations. Such a relationship-building strategy helped me to build a comfortable relationship with junior doctors to allow us to discuss problems in practice.

Moreover, to redress the difficulty of taking notes on the go, I continued to take notes on the go, tried to record every piece of relevant information, and made notes on the important points that were used to hint to the doctors to get clarification in counter-questioning during the shadowing practice. Subsequently, I used my own voice memos to mention the whole story quickly and record it. The same technique was adopted to overcome the problem of recording junior doctors' telephone

conversations with other health care professionals as they were a crucial part of junior doctors' work. I always got information from the doctor on whom she was talking with, what was the purpose of the call and what did the responder tell her that would help in her decision-making process.

The use of multiple methods of data collection in this study helped me to capture the rich description of the processes and activities of recognising the problem and solving them in the midst of action by junior doctors. The missing part of the information from one data source was bridged by the information collected from other data collection methods; i.e., I effectively used the triangulation (Patton, 2005) technique to establish the validity of data and derived conclusions. In the next section, I discuss how I analysed the data obtained from this multi-methods approach.

3.8 Data analysis

Studies based on qualitative research methods face an inherent challenge of interpreting an enormous amount of data in order to identify emerging findings (Ketokivi and Mantere, 2010; Locke and Golden-Biddle, 1997). The analysis of the qualitative data is a complicated process of converting collected data into sense-making chunks, organising it into categories, types, and patterns, to reorganise cumulative data in an eloquent manner (Jorgensen, 1989). It was precisely the case in this study. This entailed an inference process that included what Langley (1999, p. 707) refers to as 'inspiration': creating new and plausible links between empirical data, the experience of the phenomenon, a priori theory and common sense (theoretical framework). I mainly remained abductive in interpreting the data and reaching the logical conclusion (Ketokivi and Mantere, 2010) to answer the research questions and develop a rich understanding of junior doctors' use of social and material resources in problem recognition and solving process.

Abductive reasoning means inferring a logical conclusion from data through social discussions, and associated theories, which may appear to be the most appropriate explanation of the current situation (Ketokivi and Mantere, 2010; Locke, Golden-Biddle, and Feldman, 2008). In this process, the researcher uses her imagination to draw together the evidence and facts collected from empirical sites and

develop a hypothesis that would best explain what is being discussed. The perceptions and pre-understanding of the researcher always remain active in this process (Dubois and Gadde, 2002). Thus, there are times in an abductive interpretation process when the researcher is deductive, inductive and abductive in her reasoning approach.

The analysis of the data was a reiterative non-stop process that started in parallel with the data collection stage. During my shadowing, I regularly read and reflected on each day's field notes and developed extended field notes. During this process, I also wrote down the analytical comments as part of my field notes. These detailed comments on field notes were ultimately transformed into more detailed analytical memos of each participant. After the data collection, the rigorous analysis started with the repeated reading of all the extended field notes, analytical memos, reflective logs, interview transcripts and other secondary data with a focus at this stage on the analysis of individual participants (Yin, 2014). At this stage, I separated 389 recorded events. But I needed to code the significant units of text, based on the main features of the problem recognition and solving process (derived from, Epstein, 1999; Weick and Putnam, 2006; Norman et al., 2009; O'Neill et al., 2005; Gabbay and Le May, 2004; Schön 1983; Dewey 1933; Nicolini, 2013) and related to each research question to develop a holistic understanding in order to answer them.

For this purpose, Denscombe (2009) suggests a number of suitable techniques and principles for the analysis of qualitative data. I adhered to the following techniques and principles in my data analysis process:

1. In the analysis process, priority was not given to the frequency of the presented words, due to objectives of the research, but significant importance was given to the richness of the description of an event and what matters most in junior doctors' problem-solving processes and action.
2. The strategy of thick description (Geertz, 1994) was used, where I included comprehensive details regarding the context of the junior doctors' practice and events, and their associated feelings in response to the situation. It was essential to present the complexity of the problem-solving process of junior doctors. For this purpose, detailed field notes (419 pages), reflective logs (more than 300 critical events presented by junior

doctors) and interview data were used and separated into 389 events for the analysis.

3. The analysis of the empirical data was mainly concerned with problem recognition and solving process undertaken by junior doctors. So, I focused on contextual factors, relating the actions, interactions with social and material resources and behaviours and feelings of the junior doctors with the achievement of objectives, i.e., mainly addressing the health issues of patients. The related data was recorded through shadowing, as explained in the previous section.
4. The analysis did not attempt to isolate different variables from each other (such as the role of dialogue, artefacts and situational observations helping the junior doctors to recognise and solve the problem and complete their tasks). Rather, they were described to show the interdependencies of these factors.

I applied the all-inclusive approach to data analysis to all elements of the collected data, using Denscombe's guidelines. In this endeavour, I read and reread the 389 selected events and paid special attention to how junior doctors respond problem in the midst of the action. Specifically, I capture data on 1) thwarted expectation (practice is disturbed due to the emergence of problem, and standards of excellence are not met); 2) emergence of deviation when new discourse items were introduced, or new actions appeared; and 3) when operations were temporarily disturbed due to problem in action as the practitioner realised the other ways to practice (Sandberg and Tsoukas, 2011). In this process, I used NVIVO 11. I was able to refine the data to 129 events where junior doctors faced and recognise problems in their actions and solved them in a given situation. Further, I focused on how a junior doctor's feelings, emotions, and thinking are linked to associated responsive actions. It emerged that a complex nexus of knowledge sources (social and material resources) are used in the practical accomplishments of junior doctors' practices.

In the next step, I consciously attend to the guiding research questions in turn and answer them via a concise and theoretical construct. In this process, I first paid all attention to the research question, "How is mindfulness and information processing

manifested in the situated processes of junior doctors' problem recognition during their everyday work?" In this endeavour, I started reviewing datasets with a deductive approach and found that junior doctors collected relevant data during the practice and interpreted it as a problem in practice (Epstein, 1999; Norman et al., 2009; O'Neill et al., 2005). It provided me with two main aspects of the problem recognition process in empirical data; i.e., data collection »»» interpretation »»» problem recognition (Dewey, 1933; Norman et al., 2009; O'Neill et al., 2005) alike 'mindfulness' 'attention to detail' and 'attention to knowledge' (Epstein, 1999; Weick, 1993). Further, I read and reread the data sets of 129 events to find the different activities of the data collection process and how junior doctors interpret information to recognise the problem. Hereafter, inductive themes were extensively discussed with supervisors and colleagues, who challenged my interpretations. I triangulated those events with other supportive data and my personal learning during the field work. In this process, the following themes emerged from the junior doctor's data collection and manifestation of mindfulness in their everyday work: 1) personally engage activity; 2) a systematic approach to activities, and 3) attention to details or big picture. The 'personally engaged activity' (Schatzki, 1996) allows the junior doctor to capture backtalk, situated clues, and information to understand the context (Klein, 1998).

Further, in the personally engaged activity, junior doctors develop kinaesthetic senses necessary for being an expert in practice (Cook and Yanow 1993; Gawande, 2002). The data also showed that the mindfulness in the activity starts with the application of existing knowledge as such 'mindlines' and 'artistry' (Gabbay and Le May, 2011; Schön, 1983) or understanding of systematically performing an activity, i.e., adopted ways of doing something in particular professional settings. The existing knowledge (mindlines) interacts with the situation to generate new knowledge during the activity. Furthermore, data indicate that the interaction of mindlines and personally engage activity lead to the attention to details and ability to enrich the contextual information to process the situated information (Crandall, Klein and Hoffman, 2006; Epstein, 1999; Brown and Ryan, 2003).

On the other hand, the collected information and interpretations of clues required knowledge of 'evaluative criteria' to judge personal actions and thoughts, as problem definition is based on deviation from the standard of excellence (Yanow and

Tsoukas 2009). These evaluative criteria are dependent on the rules and regulations, and a collective understanding of these rules in communities of practice (Wenger, 1998). So, the theme that emerged from the data in this regard is ‘meaningful comparisons.’ Being mindful of specific aspects of practice, as discussed above, junior doctors can recognise the external surprises (lack of information, new emergent clues, missed information) and internal surprises (Plant, et al., 2017), i.e. lack of knowledge, skills etc.

To present a thick description of the context of a junior doctors’ daily routine, I presented their activities in such detail that I can articulate their different ways of practising and the role of social and material resources in everyday work. It also helped me to understand the availability of, and the various ways of problem-solving in different situations. The emerging themes are illustrated in table 3.1. Figure 3.3, in turn, shows the coding tree of the emerging themes. Hereafter, I paid attention to the second research question; i.e., “*How do junior doctors decide when and why to use social and material resources in the midst of the problem-solving process?*” This was done by using the similar iterative process of reading the datasets, and repeatedly asking the question of why practitioners intend to use social and material resources and what is gained from them? The use of ‘social and material resources’ suggest that deriving knowledge in organisational settings is a hard work of collecting heterogeneous pieces of know-how from social, contextual, technical and textual sources, fitted together to solve the existing ambiguity in the situation (Wenger, 1998).

From the analysis, it appeared that there are at least three kinds of problematic situations where sources of people, papers and online datasets rescue junior doctors in the problem-solving process. These sources of information and knowledge facilitate in: i) interpreting situated clues; ii) developing theoretical and practical knowledge to solve the problem, and iii) revealing taken-for-granted elements. These are the reasons for using social and material resources, i.e., talks, discussions, collaborative work, accessing guidelines, protocols and using search engines in problem-solving. Further, practitioners are utilising their existing knowledge/mindlines and knowledge derived from social and material resources (Gabbay and Le May, 2004). This suggested the following question should also be considered in the analysis: ‘if

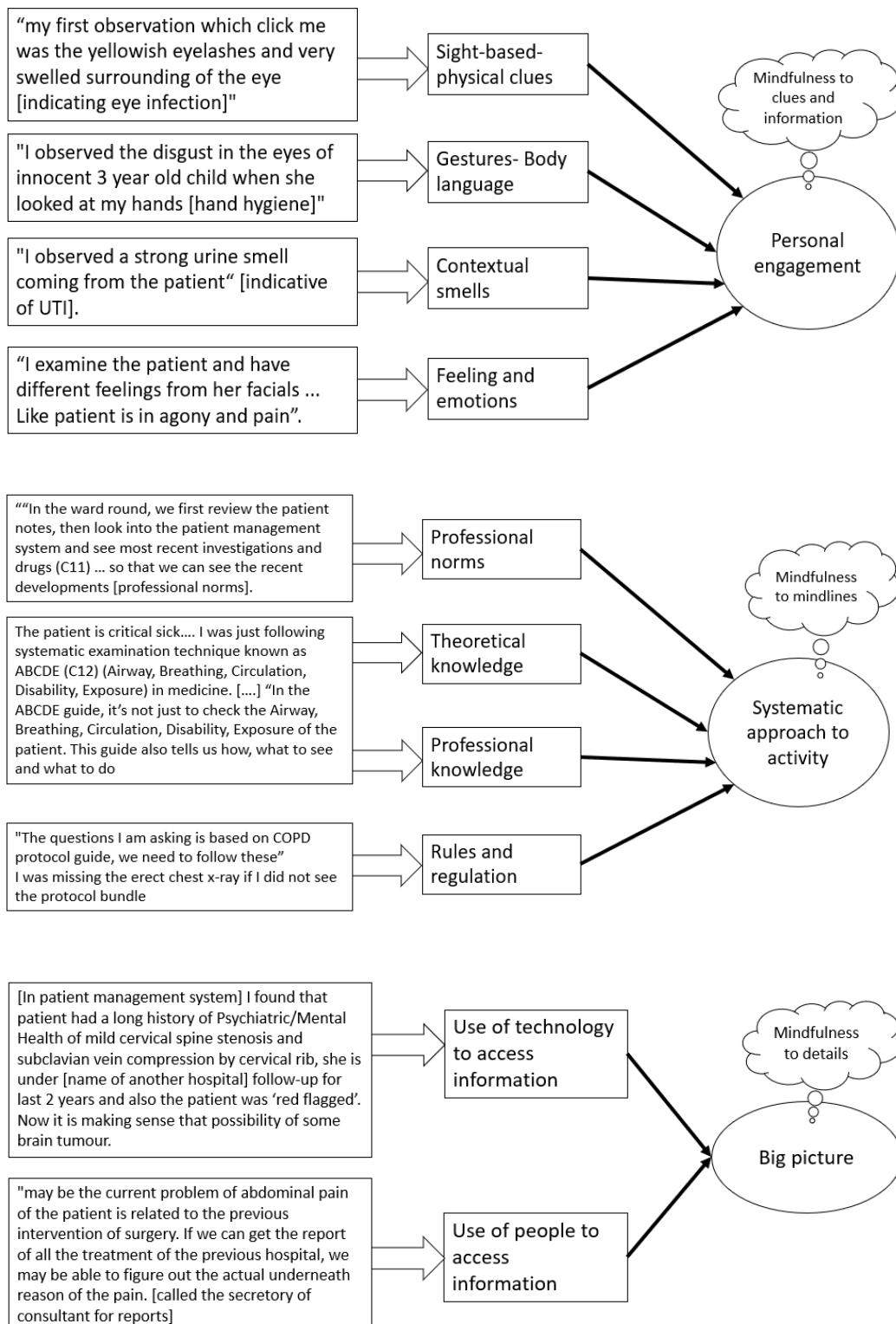
members of CoP and dataset such as guidelines, protocols, books are both helpful in solving the problem (Lave and Wenger, 1998) and provide a new solution to junior doctors, what defines the selection of social or material resources?’

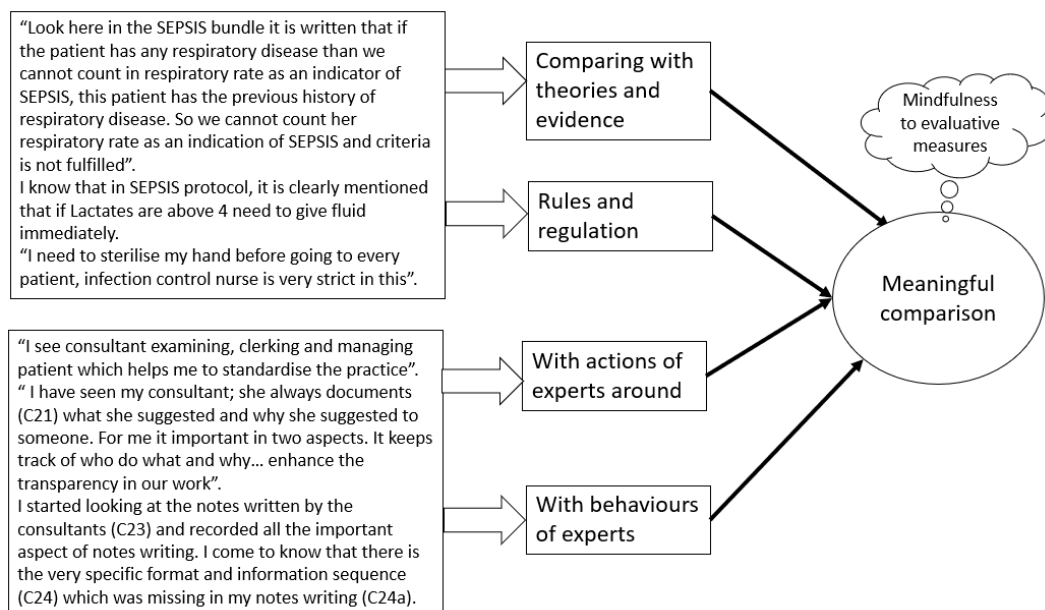
Initially, it appeared that when junior doctors were looking for tacit knowledge, they used a member of CoP and when the information required was explicit in nature (Polanyi, 1962) they can use papers, online databases, and guidelines as sources of knowledge. However, further analysis showed evidence that sometimes junior doctors used online resources for tacit knowledge and member of their CoP for the explicit knowledge and vice versa.

The data showed that this was due to the relative nature of the tacit and explicit knowledge (Polanyi, 1962). Specifically, the same problem can be tacit for one doctor and explicit for another doctor. It depends on the existing knowledge of the doctor to define the problem. So, data solved this analytical conundrum, and themes emerged to show that in situations where doctors can sophisticatedly define the problem with the professional language they use or should use material resources (paper, online database, guidelines etc.). On the other hand, if the problem is crudely defined in the professional language, junior doctors use social resources (members of CoP). Both social and material resources importantly play a pivotal role. The use of social and material resources provides an added knowledge that is coded as ‘modified and/or new mindlines’, following Gabbay and Le May (2004). These new mindlines empower a junior doctor to solve the problem and achieve the desired objectives.

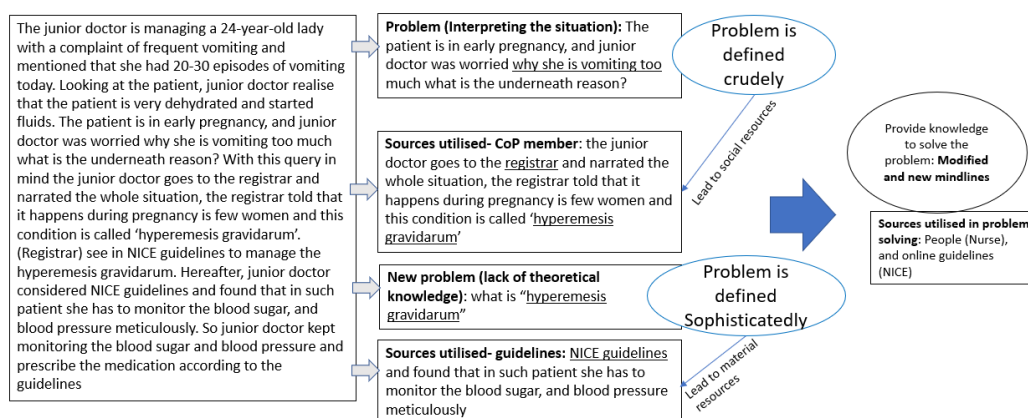
After the analysis of the first two questions, I focused on the final question of the study; i.e., “How do junior doctors work with social and material resources in the midst of their problem-solving process?” Here, I examined the data to see how a specific social resource was selected by junior doctors to be informed in a particular situation. Data showed that this depends on the expertise of the healthcare professional, their availability and their potential willingness to help at a given time to guide the junior doctor to select a specific member of CoP, also echoing Gabbay and Le May (2011).

Coding illustration of question One:





Coding illustration of question two:



3.8.1 Maintaining confidentiality and anonymity

In this study, I maintained confidentiality and anonymity by using a number of research strategies. For example, I wrote field notes and voice memos to record field observations in an entirely anonymised fashion and represented each participant junior doctor as D1, D2, ..., D24. I also ensured that I never referred to another participant's contribution to the work, nor did I ever reveal the opinions and discussions of another participant during the data collection. Moreover, in the findings Chapter 4-6, I decided to use the feminine pronoun to refer to all doctors. This was especially important for avoiding a frequent shift of him/her in the presentation of findings and being able to discuss the problem-solving process of junior doctors succinctly. It did not affect the content of the findings and discussion, as the research work mainly focuses on the activities, social and material interactions and behaviours the junior doctors without any gender discrimination. Next, I discussed the trustworthiness of the research project.

3.9 The trustworthiness of the research

The evaluation of the trustworthiness of qualitative research is an issue of considerable scholarly debate, with contradicting views among researchers (Shenton, 2003). These disagreements posit a challenge to qualitative researchers in confirming the 'reliability' and 'validity' of the research. Qualitative researchers argue that the concept of 'reliability' and 'validity' are designed to evaluate studies based on a positivist paradigm, which may not be equally compatible with the qualitative inquiries (Bryman, 2008). Consequently, a number of scholars focused on developing robust frameworks/guidelines to determine the quality of qualitative research. For example, Denzin and Lincoln (2008, p.488) proposed eight distinct features of qualitative research to measure the validity of results: 'successor validity, catalytic validity, interrogated validity, transgressive validity, imperial validity, simulacra/ironic validity, situated validity, and voluptuous validity.' This is an example of many frameworks and methods designed by researchers to assure the quality of research findings and convince the target audience of academic journals and funding agencies (Seale, 1999). Yet, there remains little consistent agreement on

how to judge the quality of qualitative research, since the excellence of qualitative research is vastly dependent on the aims and objective of the study.

However, Lincoln and Guba's (1985) framework for evaluating qualitative research has wide acceptance. This is because they develop the framework by keeping in mind that in qualitative research, there may exist multiple realities, contrary to positivist research founded on a single version of reality. Lincoln and Guba (1985) argue that this is the central difference between the construction of knowledge in two streams of research, qualitative and quantitative. Based on this, they submit that we look at the 'trustworthiness' of qualitative research findings to establish its quality. They suggest that four criteria pursue the 'trustworthiness' of qualitative inquiry: credibility, transferability, dependability, and confirmability. These are discussed below as they apply to this research.

3.9.1 The credibility of the research

Lincoln and Guba (1985) offer a number of strategies to achieve credibility in research findings, of which, I adopted the following six techniques to ensure the credibility of the study. These strategies are 1) selection of suitable research methods to collect and analyse the data in accordance with the aims of the study, 2) prolonged engagement with context and participants, 3) persistent observation, 4) triangulation, 5) member checks and 6) peer debriefing.

3.9.1.1 Selection of the suitable methods

In this research, the research methods were sagaciously selected to achieve the objectives of the research, as proposed by Yin (2014). I have discussed the selection of research methods and rationale for selecting them in this research. These methods have been employed in various similar projects in the past.

3.9.1.2 Prolonged engagement

In the research process, I made special efforts to develop early familiarity with the culture of the NHS hospital setting and with potential participants by using a number of strategies. For example, I paid several informal visits to observe the hospital working environment and make myself familiar with the junior doctors'

training system by reading the junior doctors' reports, training syllabus, and assessment process. Because I regularly visited the hospital and also have family and friends who are junior doctors, I was able to extensively interact with the junior doctors and discuss different aspects of their practice. During such visits, I particularly paid attention to the rules and regulations of hospital settings, and never visited in non-visiting hours. I engaged myself with the context for the period of 5 months (March 2014 to October 2014). The engagement with the context provided me with a good idea of the junior doctors' responsibilities and their formal aims and objectives in the hospital setting.

Further, I got a chance to present the aims and objective of the research in the junior doctors' weekly training session, and that helped me to attract interested and passionate participants to the research. In doing so, I was able to develop trust and rapport with the potential participants (junior doctors). This process helped me to establish the 'random sampling' technique even though my participant group had been intentionally selected; i.e., junior doctors at initial trainee stage. Furthermore, this study aimed to understand how junior doctors undertake the problem-solving process in their daily work and learn from it. It would have been a difficult task without prolonged engagement with the research participant and research site. Thus, I shadowed and held frequent ethnographic interviews on the research site for nine weeks (45 days) within a time span of 10 months (October 2014 to August 2015) and collected reflective logs from 10 participant junior doctors, which reflected on more than 300 critical events faced by junior doctors in their daily practice over the last six months. This prolonged engagement with the research participants and site helped me to enhance the credibility of data attained from the participants.

3.9.1.3 Persistent observations

Lincoln and Guba (1985) suggest that it is crucial to ensure that the themes and trends which are most relevant to the phenomenon should be captured in a level of detail that is hardly possible without persistent observation of the participants, in my case. The detailed and nuanced data was collected by observing the participating junior doctors from the time they arrived at the hospital. Often, I met them in the car park, and went to the ward together and grabbed a cup of coffee on our way.

Similarly, I observed them until they left for home after finishing their shifts. In other words, I observed and captured the essence of every moment the junior doctors spent in the hospital. I also conducted ethnographic interviews where possible to understand their feelings and emotions and comprehend the behavioural aspects of their actions and work. Moreover, with the use of the junior doctors' portfolio records helped me to understand what work they do at home. Thus, persistent observation technique employed in this study enhanced the relevance of data collected in the field work.

3.9.1.4 Triangulation

Triangulation aims to verify and test the research findings by diminishing the systematic biases through use of various techniques, such as multiple data sources, research methods, selection of participants and a range of theories used to articulate the understudied phenomenon (Lincoln and Guba, 1985; Patton, 2005). In this study, triangulation was achieved through the recruitment of a wide range of participants and utilisation of a variety of data sources and methods. First, as one way of triangulation, I compared and contrasted the individual viewpoints and ways of doing things with those of other participants (Van Maanen, 1983). Consequently, a rich description of participants' actions, behaviour and thinking emerged during the analysis. Second, as I have explained previously in this Chapter, although the primary source of data was from shadowing, which was supplemented by interviews, artefacts, reports, and the junior doctors' reflective logs, the study also includes the data from junior doctors' conversations with senior doctors and supervisors' comments on the reflective logs, which strengthens the triangulation of the study's findings. Further, I also employed member check techniques to verify the shadowing and other data.

3.9.1.5 Member checks and iterative questioning

Member checks are a process in which "data, analytic categories, interpretations, and conclusions are tested with members of those stakeholder groups from whom the data were originally collected" (Lincoln and Guba, 1985, p.314). It is considered a crucial aspect of maintaining the credibility of qualitative research. In

this study, iterative questioning was undertaken through interactions during shadowing, including whenever there was any confusion or observed actions and behaviours needed an explanation from the participants. I also employed the 'member check' technique to verify the conclusions derived from the data. I provided each participant with the opportunity to reflect on the findings of the research in individual meetings. These sessions were intended to share and compare my understanding of participants' work and the participants' viewpoints. These sessions of collective discussion were a great success, in that the junior doctors found them to be a tremendously worthwhile and an accurate record of their work and the problem-solving process. Moreover, their detailed feedback and explanation of certain points enriched the collected material and enhanced its accuracy.

3.9.1.6 Frequent debriefing sessions

During the data collection and particularly during the analysis process, regular debriefing sessions were arranged with supervisors to establish the credibility of the research (Lincoln and Guba, 1985). In this study, I frequently engaged in collaborative conversation with my academic supervisors and with the site supervisor to discuss the collected data, alternative approaches, weaknesses in the research process and development of the ideas and interpretations of the data. These sessions also helped me to recognise the personal biases in interpretation. Moreover, as a formal requirement of a PhD at Warwick Business School, I presented the research in front of a panel of five experts and took their advice and suggestions to strengthen the credibility of the study.

3.9.2 Transferability of the findings

The transferability of qualitative research refers to the likelihood of the application of research findings in another context of the study, which echoes the idea of external validity in quantitative research (Silverman, 2006). Since qualitative research findings are specific to a small number of participants in a specific work context, it is hardly possible to validate that conclusions are applicable to other settings and populations (Lincoln and Guba, 1985) in the same manner. For this purpose, what qualitative researchers can do is to develop and explain working

conditions of the context and characteristics of participants and their work. Little can, therefore, be done apart from thick descriptions of the context and participants' work. Thus, in this project, I explained the work context of an NHS hospital (i.e., flat organisation, employees, access to different people of different expertise, availability of explicit sources of knowledge, collective assignments and shared responsibilities, etc.) and explained the junior doctors' working routines before discussing the rich data (419 pages of shadowing notes, 300 pages of reflective logs, 22 interviews, and several artefacts) related to the junior doctors' problem-solving process. Now, it is the responsibility of readers and/or future researchers to adopt the findings of the study with the well thoughtful process of analysing her context of the study and the context of this study, before considering the transferability of the findings.

Further, the study defines the context in methods that describes two basic boundary conditions to generalise the findings. First, the organisational context should be based on collaborative work, i.e., shared assignments and responsibilities among different groups and teams in the organisational settings. Second, the study suggests a model of the problem-solving process that can be equally effective in professions that are significantly dependent on profession-based knowledge, with workers known as knowledge workers (Blackler, 1995). Moreover, in this Chapter, I provided rich detail of each step of the research process undertaken to achieve the aims of the project. The detailed description of the research process provides sufficient guidelines to replicate the research process in the future.

3.9.3 Dependability of the study

The third conditions to establish the trustworthiness of the study is to show that if the study is repeated, in the same context, with the same participants, and with the same methods, similar results should be replicated, i.e., dependability. Lincoln and Guba (1985) argue that credibility and dependability are closely linked, in practice, and showing the former also ensures the latter. Thus, via the use of different techniques as shown in the previous section, I demonstrated the credibility of this research. The dependability of the research process is also ensured. In order to demonstrate dependability more directly, I provided full details of the research and data collection processes in this Chapter. Such in-depth reporting enables the reader

to assess the research dependability; i.e., that highly relevant method and processes were followed in this research project. The following Chapters 4-6 presents the findings of the study by using the vignette approach to data analysis and demonstrates the interdependencies of social and material resources and doctors' problem-solving.

3.9.4 Confirmability of the study

In qualitative research, confirmability refers to minimising the researchers' biases in interpreting the data (Lincoln and Guba, 1985). To maintain the confirmability, I took the following steps. First, during the data collection process, I recorded what I observed participants were doing and kept my assumptions and analysis separate. Second, the technique of triangulation was employed with a special emphasis on the confirmability of the research work. Finally, the 'trial audit' that is critical for ensuring the confirmability of the research findings. The detailed description of key methodology decisions, such as research design, selection of data collection tools, data collection process, were provided in this Chapter. Furthermore, this Chapter also provided a comprehensive account of the process of data analysis and the emergence of the theme from data to ensure the confirmability of the study.

3.10 Limitations

This study is carried out in one NHS England trust hospital. Twenty-four participants were recruited for shadowing and interviews, which limits the transferability of the study to some extent. The problem was addressed in the research design with the prolonged engagement and rich descriptions (Denzin, 1989) of the junior doctors' context and practice in hospital settings. Moreover, I have provided a rich account of the research design and method in this Chapter. This can therefore be independently repeated in other NHS hospitals and is very helpful for future researchers in terms of the potential to explore the phenomenon to verify the extent of transferability of the study's findings in other fields, such as consultants, lawyers, engineers, software developers and so-called knowledge workers (Blackler, 1995).

JUNIOR DOCTORS' PROBLEM RECOGNITION AND PROBLEM-SOLVING IN NHS (ENGLAND) HOSPITAL SETTINGS

This section reports the findings on the constructs of junior doctors' problem-solving, namely, problem recognition, improvisation and achieving desired objectives in hospital settings, and their relation to the social and material resources of the context. The main constructs of the problem-solving are explored by shadowing 24 junior doctors in two departments for 45 days and are supplemented with 22 participant interviews and reflective log entries (over 300 critical events). The findings section is organised into three Chapters: 4, 5 and 6. Each chapter is devoted to responding to one of the study's three guiding research questions; i.e.:

1. How is mindfulness and information processing manifested in the situated processes of junior doctors' problem recognition during their everyday work?
2. How do junior doctors decide when and why to use social and material resources in the midst of their problem-solving process?
3. How do junior doctors work with social and material resources in the midst of their problem-solving process?

The first Chapter of this section, as mentioned above, will illustrate how junior doctors recognise problems in their practice in hospital settings.

4 CHAPTER 4: THE MANIFESTATION OF MINDFULNESS AND INFORMATION PROCESSING IN THE PROBLEM RECOGNITION

4.1 Introduction

As noted in the literature review, recognising problem or surprises and confusing situations is essential to being able to solve the problem. However, little is known about the activities and processes involved during which professionals recognise problems in their practice (Tsoukas and Yanow, 2009) and particularly about how junior doctors manifest their mindfulness and process information to arrive at a feeling of discomfort/surprise in their practice.

The findings of the study explored the four entangled themes supporting the mindfulness and the process of problem recognition in junior doctors' practice in NHS hospital settings. These four constructs are: 1) personal engagement; 2) a systematic approach to activities; 3) meaningful comparison with contextual norms of practice, and 4) attention to the 'big picture' of practice. The definition and link of emerging themes with extant literature are shown in table 4.1. Further, the way that these constructs delineate, how they relate to each other and how they all define the process of problem recognition in junior doctors' everyday work, is discussed in detail in the light of empirical evidence in this Chapter.

4.2 The personal engagement in the context to recognise a problem

The findings of the study show that personal engagement in context facilitates junior doctors in recognising problems in their everyday work. Personal engagement can be represented by the entanglement of the kinaesthetic senses that provides the embodied engagement and application of the repository of knowledge. In other words, personal engagement is characterised as the body and mind engagement of junior doctors at work. Personal engagement is an essential requirement for a junior doctor to be able to understand the breakdowns and arising problems in everyday

work. I will show illustrative examples of junior doctors' everyday work in a hospital setting and the process involved in recognising problems in everyday work.

Definition of emerging themes (question 1) and link to extant literature.
(Finding sections 1)

Main Theme	Category definition	Sub-categories	Link to the extant literature
Problem recognition.	<p>Personal engagement: Body and mind involved in the activity to capture kinaesthetic and tactile, smell, gestures, and information from context.</p> <p>It is embodied (body-mind) engagement with the world to keep maximum awareness of it (Merleau-Ponty, 1962).</p>	<ul style="list-style-type: none"> • Physical Clues • Gesture body language • Smells • Emotions and feelings 	<p>‘capturing backtalk’ (Schön, 1983)</p> <p>‘moment-to-moment’ attention (Epstein, 1995)</p> <p>Being there in the present, with both body and mind (Weick and Putnam, 2006)</p> <p>Information acquisition (O’Neill et al., 2005)</p>
	<p>A systematic approach to activity: Organised and professionally recognised ways of doing an activity,</p>	<ul style="list-style-type: none"> • Theoretical knowledge • Professional Norms • Rules and regulations 	<p>logical steps of an activity (Rogers 2003; Banning, 2008),</p> <p>‘Mindlines’ (Gabbay and Le May, 2004)</p>

	those are known publicly.		‘capacity for action’ (Weick and Sutcliffe, 2006)
	Big picture: The attention to details using all possible ways to be informed about the context.	<ul style="list-style-type: none"> • Use of tools and technology • Talking and discussing to get hold of the situation 	<p>Information acquisition (Tanner et al., 1987)</p> <p>Situational awareness (Randel, Pugh and Reed, 1996)</p> <p>‘rich awareness of discriminatory detail’ (Weick and Sutcliffe, 2006)</p>
	Meaningful comparison: comparing personal actions and thoughts with theories, evidence, experts’ practice to evaluate personal actions.	<ul style="list-style-type: none"> • Rules and theories • Evidence • Experts practice knowing how rules are interpreted 	<p>Evaluative measures are ‘shared the property of CoP’ (Wenger, 1998)</p> <p>‘Mindlines’ (Gabbay and Le May, 2004)</p> <p>“[...] attempting to achieve the standards of excellence (Yanow and Tsoukas, 2009)</p>

The findings of the investigation suggest that embodied engagement reveals situated clues; i.e., collected information, enable them in recalling related

knowledge, and its application provides a capacity to process the information into practical meanings (information processing). It significantly facilitates them in recognising the problem in action. The information means inscribing and arranging context-specific clues, events and issues, and their relationship with each other. Further, the doctors' existing knowledge suggests the capacity to employ judgements on the part of individuals that is based on an appreciation of context or is derived from the theory, or both (Dewey, 1932; Gabbay and Le May, 2011). In other words, the secret of realising the problem lies in the entanglement of observations of situated clues (through embodied engagement) and the application of the doctors' knowledge; they both work in harmony in the junior doctors' practice. Embodied engagement provides various types of relevant clues to the junior doctors to recognise problems in everyday work, such as physical clues, different smells, and whiffs, gestures and feelings and emotions. How embodied engagement and application of the junior doctors' knowledge work in the practice to recognise problems, will be the focus of the following discussion, via the presentation of particularly notable illustrative examples.

4.2.1 Physical clues and existing knowledge

Embodied engagement encourages junior doctors to record physical clues and recalling related knowledge to make judgements about the significance of these clues in the realm of their existing knowledge. For example:

“The first observation, which occurred to me was the yellowish eyelashes and very swollen surrounding of the eye. Basically, her eye was very dirty. With a yellowish eyebrow, I could see that her eye was infected too. That is called conjunctivitis... But I don't know how to manage it.”

(Accident and Emergency department-D1 on 19-10-14)

Here, D1 carefully made her observations and tried to accomplish the task. In this situation, the junior doctor's embodied engagement in the everyday work resulted in a kinaesthetic acquisition of the physical clues and evidence (yellowish eyebrow and swollen eye). The physical clues act as the information of context,

‘yellowish eyebrow and swollen eye’. This information triggered D1’s ability to recall related knowledge and interpret information. The interpretations continued, as D1 explained, “I could see that her eye was infected too. That is called conjunctivitis,” gave her new direction to treat the patient for conjunctivitis. At this stage, she realised that “I don’t know how to manage it,” and found the problem in her everyday work. The relational understanding of physical clues in a specific situation, guided by the existing knowledge of the junior doctor provided D1 with an opportunity to realise the problem and act mindfully in her work. The physical clues can be of any type that emerges from the observation of the patient’s body, ranging from the swelling to a feeling of dryness in the body of the patient. For example, in the interview, D17 highlights the importance of physical clues, as follows:

“...in different situations, the look of the patient plays an important role in guessing what can be the possible medical management of the patient. For example, if the patient is frequently vomiting, it is an indication that the body is losing water and most importantly, you must notice the lips of the patient to check whether they look very dry and white if dehydrated.”

(Accident and Emergency department-D17 on 27-06-15)

It means that even if a patient is complaining of frequent vomiting, but her lips do not look dry and/or white, it is highly likely that the patient is not medically dehydrated. It also emerged that when recording the relevant physical clues in a particular situation, junior doctors take appropriate action; for example, when a junior doctor was about to explore the fracture of a 1.5-year-old child because the mother was complaining of her child limping:

The mother said that the [1.5-year-old] child had been limping on his right foot since morning, and she did not know what happened. The child was badly crying [...D11 engaged the child with the help of toys available in the department. D11 asked the mother to let the child stand on the bed. Then D11 offered the child a toy, and to her

surprise, the child ran towards her to take the toy. D11 to the mother, "he is walking absolutely fine. He is not limping."

(Field notes: Accident and Emergency department-D11 on 14-11-14)

In the above vignette, D11 first engaged the child and then let her walk to observe the reaction of the child when she put weight on foot. In other words, physical clues are not always readily present in the situation; junior doctors take specific actions to record relevant physical clues. From the observation that the child was not limping, D11's current knowledge suggested to her that the child was not in pain. In this process, D11 tried to build assumptions and a rational explanation of the situation as follows:

"...the mother is being over-protective and worried about her child... Otherwise, there is no severe injury, but I will reassure her after coming back to the child again."

(Accident and Emergency department-D11 on 14-11-14)

The assumption and reasoning that supported the contextual grounds and D11's reasoning that the 'mom is protective,' and which led to the conclusion that there was no need for an x-ray, was based on the fact that after returning to the child, he started playing with her again. She did not find the child limping anyway. The observation of physical clues and her professional knowledge indicated to the junior doctor that it could not be a fracture, because a child with a fracture should be in pain. This link to observations and a conclusion is facilitated through the knowledge of the doctor. D11, therefore, counselled the mother and reassured her that there was no fracture and that her child was absolutely fine.

Similarly, in the Acute Medicine ward, D8 was busy in her job when she received a call from the Haematology department to let her know that a patient's [name] potassium was very high at level 7, and she needed to review the patient immediately. D8 moved quickly towards the patient but having first looked at the patient reading a digest; she calmed down. I asked D8 why she became relaxed if raised potassium levels is an emergency condition. She replied:

“When the potassium level is as high as 7, the patient cannot be conscious, and there is a very high chance of cardiac arrest. After I saw the patient reading a digest, it confirmed to me that the blood reports were not right [...] I realised that the blood sample must be haemolysed.”

(Acute Medicine ward-D8 on 07-11-14)

The physical clue of observing a patient reading a digest enable the junior doctor to recall related knowledge that provided assumptions and reasoning for these clues. That is, if a “potassium level is as high as 7, the patient cannot be conscious”, indicated to D8 that there is no need to rush and call for help in a situation when the patient is fine. The mindfulness of clues and the knowledge facilitate junior doctors in developing assumptions and reasonings for the situated clues. In the above case: the ‘patient cannot be conscious’ is her knowledge.

Thus, the physical clues and evidence that are vested in various outlooks, such as looking lethargic, uninterested in activities, dry lips, limping, etc., provide information about the context to the junior doctor, with the help of embodied engagement. This information is processed by the junior doctor’s existing knowledge, by developing assumptions and justifications and making judgements about the problematic nature of the recorded information. It is an information process at this stage, i.e., application of knowledge. Therefore, the physical clues and the junior doctor’s knowledge facilitate them in recognising the problem in everyday work. Embodied engagement helps the junior doctor to develop an inventory of physical clues. The physical looks of the patient and observations provide an opportunity for the junior doctor to reason, justify and judge the clues with the help of their knowledge base. As I have mentioned above, the related knowledge refers to the junior doctor’s existing capacity to make judgements and distinctions in appreciating recorded contextual clues and already known theories, or both (Schön, 1983). The process of reasoning and justifying clues with the existing mindlines is an ability of information processing of the junior doctor. The matching process takes a matter of seconds; it is a momentary pause. It guides the junior doctor towards the right track and realisation that there is a problem in everyday work.

4.2.2 Contextual smells and whiffs as clues and indicative of a problem in the everyday work

Another aspect of doctors' embodied engagement, which provides clues to help realise the problem, is recognising the unusual whiffs and odours in the context and driving meanings through reasoning and justifying these changes. The whiffs in the context tempt the junior doctor to react, but it cannot be done unless junior doctors pay a conscious effort to record (embodied engagement) and respond to them. For example, in the Accident and Emergency department, D20 was reviewing a three-year old-child with a high fever. When she attempted to examine the child, the child did not allow her to examine her throat to rule out a throat infection properly. Otherwise, the child's ear, nose, and chest were clear. At first impression, D20 was considering a viral illness and discharging the patient without antibiotics, but ended up prescribing antibiotics:

"When I tried to examine the child's throat, she did not let me see properly, but the smell coming from the 3-year-old child's mouth was noticeable. It gave me a feeling that she is had tonsillitis [a bacterial throat infection]. Because the child's fever was too high to consider just a viral illness.... there must be some infection, so I prescribed her antibiotics."

(Accident and Emergency department-D20 on 05-08-15)

In the abovementioned situation, D20 would have ignored the possibility of throat infection if she had not responded to the smell coming from the mouth of the child. The noticed smell was then processed by the junior doctor's knowledge to give practical meaning to the smell, to conclude that the child was suffering from a throat infection. Another example was in the Accident and Emergency department where D4 related the smell of alcohol coming from the patient to her non-responsiveness to the pain of her eye wound. The patient was not interested in getting any treatment and considered her eye wound to be a minor injury that did not need any medication:

“The patient smells badly of alcohol. I think she is not feeling any pain because she is drunk, though her [eye] wound is very severe... I not only need to give her [patient] pain killers... the wound also needs stitches.”

(Accident and Emergency department-D4 on 28-10-14)

D4 inspected the wound with full care because the patient was drunk and not interested in treatment. D4 related the patient's behaviour with the effect of alcohol and considered that alcohol decreases the feeling of pain. This is not the end of the story; embodied engagement is used to record unusual smells (inventory of clues: information), active professional knowledge is used in information processing to interpret the practical meanings of the clues, and at the same time, actions used to probe the situation also play an important role in problem recognition. For example:

The nurse asked junior D18 to cannulise a patient. D18 came to the patient's bedside and cannulised him. Subsequently, she moved to check the catheter and asked the nurse to test the patient for a urinary tract infection (UTI). [...] It turned out the patient had a severe UTI. At the same time, she prescribed an IV antibiotic and asked the nurse to start the IV antibiotic immediately.

(Field notes: Acute Medicine ward-D18 on 30-06-15)

In the vignette above, D18 just came to cannulise the patient for IV fluids, but the urine smell is coming from the patient directed her actions to check the catheter and perform a urinary tract infection test. As mentioned by D18:

‘When I went to cannulise the patient, I observed a strong urine smell coming from the patient. Such a urine smell is an indicator of either a displaced catheter that may be leaking urine somewhere or a patient that is suffering from a UTI [urinary tract infection]. ...that is why first I checked the catheter for leakage. ...that was fine. Then the possibility of a UTI was confirmed by a simple urine test for a UTI.’

(Acute Medicine ward-D18 on 30-06-15)

Above evidence shows that the recognition of a '*strong urine smell*' leads the junior doctor to justify and reason the situation through her personal knowledge. That is, if there is a smell of urine, the possibilities are either a 'displaced catheter' or a 'UTI'; in this case, the personal knowledge is derived from theory and an appreciation of contextual clues. It is how D18 immersed herself with information processing in the context. D18 checked both possibilities through her actions of checking the catheter and carrying out a UTI test. This resulted in the timely diagnosis of the patient's UTI, recognising the problem and directing actions to overcome the problem by prescribing antibiotics to the patient. Therefore, embodied engagement provides an opportunity to record and find a reason for the unusual smell with the help of personal knowledge. The reasoning and justification are verified by taking actions in the situation to understand the actual problem.

In all the examples mentioned earlier, contextual smells recorded through junior doctors' embodied engagement provide clues to reason the situation. The process of reasoning, justifying and making judgements on these clues involves the skill of information processing to give meanings to these clues, by drawing on personal knowledge. Personal knowledge refers to a junior doctor's existing capability to make judgements and distinctions about the clues to realise the potential confusion, ambiguity or problem in practice. Therefore, it means a junior doctor thinks and relates the situation to the clues to give it a practical meaning, and with the help of her existing knowledge, she is involved in 'retrospective thinking.' The information processing with the situation involves 'retrospective thinking.' Retrospective thinking is thinking back, and relating the current situation with previous, similar experiences in some way and using theoretical knowledge to develop assumptions, justifications and make judgements about the arising problem in practice. In all the above examples, junior doctors are involved in 'retrospective thinking' that is also indicated in the current conceptualisation of reflective thinking (Mamede and Schmidt, 2004).

There is a possibility that contextual smells may indicate arising problems in practice; hence, to remain reflective and recognise problems in action, junior doctors

need to record and respond to different whiffs consciously and smells with the help of embodied engagement. These clues act as information for the junior doctor, and the information is then processed into practical meanings through information processing, with the help of the junior doctors' knowledge/mindlines and associated actions to realise the problem in practice.

4.2.3 *Body language and appearance of the patient is indicative of a problem in the practice*

The findings suggest that the body language and appearance of the patient and colleagues are also important to recognise the problem in practice. This is because there are some inexpressible feelings, which can be articulated by reading the body language and appearance of patients and colleagues. During the fieldwork in the Accident and Emergency department, D1 used to hold the ballpoint in her hand without the cap on and make dots on her hand. Her hand looked dirty due to ink being all over it, and I did notice this behaviour. During her shift, D1 went to check on a 3-year-old child. However, she immediately came out of the patient bay, gave her hands a thorough wash, applied gloves and went back to the patient. When I asked, what had happened and why she had washed her hands, D1 said:

“Did you notice the ballpoint dots on my hand? Apparently, they look dirty. I saw disgust in the eyes of an innocent 3-year-old child when she looked at my hands. That’s why I came out of the patient room and washed my hands. Although my colleagues have noticed this and pointed it out to me many times, I was never able to realise how it could influence my practice because I always use antiseptic to wash my hands. They are surely germ-free, but they look dirty. I know that my hands are sterilised but not patient-friendly. I should not be doing this again.”

(Accident and Emergency department-D1 on 19-10-14)

In the above vignette, it shows that the junior doctor was not paying attention to her relatively poor practice when her colleagues pointed it out to her. However, when she herself experienced the effect her act of making dots on her hand had on

the patient's satisfaction by observing the gesture of the 3-year-old kid, she admitted, 'I felt the disgust in the eyes of a 3-year-old innocent kid'. The observation of the patient's gesture made the junior doctor decide to keep her hands neat and clean in the future. Moreover, the reading of the gesture and the giving-of-meaning was based on her personal knowledge of knowing that a patient does not like a doctor with dirty hands. To strengthen my previous point on 'retrospective thinking', here the information process in the situation involving the junior doctor's previously helpful understanding of the context; i.e., "my colleagues have noticed this and pointed it out to me many times" shows that during information processing, she is clearly involved in retrospective thinking. The distinction here is when the junior doctor develops assumptions, reasons and justifies the clues individually using her personal knowledge, she is always involved in retrospective thinking. Similarly, in another situation, D23 told that the body language and expressions of the patient are important when attempting to understand the real cause of the problem:

"I examine the patient and have different feelings from her facials expressions ... Like the patient is in agony and pain. But the patient is not as expressive as she should be. I need to keep the differential of perforation in my mind; that is a very painful and emergency condition."

(Accident and Emergency department-D23 on 16-08-15)

There was evidence that junior doctors reflect on this aspect of practice in their reflective logs as well. For example:

My feelings were that the lady was dry, tachycardia and acidotic.... So I am missing something. Maybe she needs fluids immediately and insulin sliding scale which I then prescribed. The lady was fine in the evening when I finished my shift.

(Reflective log 4)

Thus, considering body language and giving meaning with the help of personal knowledge facilitates junior doctors in feeling confusion and discomfort and recognising the problem in practice, which then directs them towards thoughtful, responsive actions.

4.2.4 Feelings and emotions are based on capturing clues

The above examples also indicate that the feelings and emotions engendered during junior doctors' practice are mostly based on clues and evidence which doctors record in capturing physical clues, body language, and colour and/or in conversation. Looking back at previous examples, when D11 saw the child walking without limping, this created the feeling that the mother may be being over-protective and that the child is fine, but the doctor needed to be reassured by observation.

A deliberate and conscious effort is required on the part of the junior doctor to feel ambiguity and discomfort in a particular situation. As I mentioned in the above sections, embodied engagement provides situated clues that act as information. The information is processed with the help of personal knowledge, and the junior doctor is continuously involved in information processing in a given situation. It is information processing that generates the feelings and emotions in the doctor to be able to recognise the problem in practice. For example, when D8 felt relaxed when she saw the patient suspected of having a potassium level of 7 reading a digest. Why was she relaxed and comfortable with the situation? It is not just the physical clues of seeing a patient active and reading a digest, but it is the way D8 interpreted the physical clues; i.e., "when the potassium level is as high as 7, the patient cannot be conscious". This ability to process the information generates the permeability of the junior doctor to feel that something is wrong, confusing or problematic in a particular situation. It also showed that problem-solving is a continuous process during the professional work of the junior doctor.

Moreover, all examples indicate that the feelings are always based on clues and evidence and are perceived with a conscious effort and enable the junior doctor to process information. The skill of linking feelings and emotions to the contextual clues, however, considered as a tacit skill because during interviews when I asked

junior doctors how they recognise the patient is not feeling well just by looking at her, most of the doctors responded that ‘they just feel that the patient is sick,’ without giving me a concise answer. Yet as shown by my field notes, when I asked in a particular situation why a junior doctor felt that a patient was dehydrated or in pain etc., they were able to give me a specific reason. For example, D1 felt that the patient was not happy with the dirty look of her hands because D1 noticed the disgusting look in the patient’s eyes. Similarly, D21 felt that the patient was in severe pain by noticing the patient’s facial expressions. Thus, the problem-solving is a continuous process, and situated clues and evidence require a conscious effort to involve them in interpreting information to feel discomfort, ambiguity and/or confusion in the situation. The junior doctors can reflect on the evidence, which generates a feeling to remain more reflective in practice and recognise a problematic situation.

4.2.5 Summary

The findings of the study show that personal engagement in the context of the junior doctor is significantly important in recognising a problem in practice. Junior doctors established personal engagement with the context as soon as practice starts. Personal engagement facilitates three functions of problem definition process, namely, 1) capturing aesthetic and kinaesthetic clues, 2) recalling related knowledge and 3) continuous evaluation of actions and interpretation. The aesthetic and kinaesthetic clues are the appreciation of contextual physical clues, smells, gestures and body language that act as a source of information for a junior doctor to recognise the problem. The collected information is then enabled the junior doctor to recall related knowledge/mindlines and process information into practical meanings. During the processing of the information, the junior doctor is engaged in information processing in the context. The information processing is a mental process to develop assumptions, reasoning, and judgement of the contextual information in the realm of existing knowledge of the doctor. As this existing knowledge/mindlines is an existing capacity to employ judgements on the part of individuals that are based on an appreciation of context or are derived from the theory, or both (mindlines (Gabbay and Le May, 2011), the junior doctor is involved in ‘retrospective thinking’

during the information processing. Finally, during this process, the junior doctor may realise the problem as a surprise that something new emerged or not able to recall the related mindlines in the interpretation of the clues and subsequently, the junior doctor realises the confusion, ambiguity and/or problematic situation in her practice.

4.3 A systematic approach to activities facilitates organising a search of related clues: problem recognition

In the previous section, I showed that embodied engagement is the focal ingredient that helps junior doctors to record situated clues and these clues act as ‘situated information’ that directs them towards arising the problems in practice. However, the junior doctors’ practice in a hospital setting itself is complex and messy (Nicolini, 2013) to make distinctions on how and what to record, and what to ignore. In other words, if a junior doctor is not able to internalise the pertinent information (clues) through her embodied engagement, it presumably decreases the capability to recognise problems in her practice. The findings of the study show that in order to enhance embodied engagement in practice to collect relevant information (clues), junior doctors make a conscious effort to follow the systematic approach to activities based on professional knowledge. The systematic approach to activities indicates that junior doctors organise their workflow of activities to keep track of the ongoing involvement with work and record clues to see if they are heading in the right direction or if there is any problem in their practice. The systematic approach to activity resembles with existing mindlines of the doctor for doing a task (Gabbay and Le May, 2011).

The junior doctors’ embodied engagement in practice, the finding suggests, is enhanced by consciously pursuing the systematic flow of every small activity to accomplish a whole day’s jobs in an organised manner. Looking at the example of a ward round in the Acute Medicine ward, D3 explained that:

“We start the ward round by looking at the list of all the patients, and we prioritise the patient list. Then, before going to see each patient, we look at all the medical history of the patient on the

computer (software known as a patient management system) and the patient's notes. After that, we go to the patient and ask how s/he is feeling, asking relevant questions about the patient's history, at the same time as examining the patient and recording the activity in the patient's notes. This is the norm in the ward."

(Acute Medicine ward-D3 on 23-10-14)

Evidently, here D3 mentions a flow of activities that are ordered in an organised way to complete the ward round effectively, coinciding with my observations. In the ward round, doctors first 'prioritise the patient list' and then check the patient's current medical conditions by using various resources such as the patient's notes and the patient management system. After that, the doctor goes to the patient's bedside to ask typical questions and examine the patient to understand how best to manage the patient according to the current conditions. It shows the overall purpose of every activity in the ward round, which directs junior doctors to keep focused on important clues and information to look out for in the practice. These sequential activities are not just organisational protocol, but rather every activity in some way informs the next one:

"In the ward round, we first review the patient's notes, then look into the patient management system and see the most recent investigations and drugs...so that we can see the recent developments. Then we review the whole medical history of the patient before going to the patient for a consultation. It is essential to keep track of what.... What we should ask the patient that helps [...]"

(Acute Medicine ward-D17 on 27-06-15)

On the one hand, the systematic process of activities provides reasons and justifications for the next step. On the other hand, these activities include the effective use of technology to remain informed, i.e., in the way that D17 mentioned the use of the 'patient management system.' The information D17 collected from the patient management system required thoughtful actions to see the patient's 'recent

developments.’ The systematic process of various activities (reviewing a patient’s notes, using the patient management system, history taking, etc.) to get pertinent information is central for embodied engagement. Furthermore, in the process of activities, there is a specific way of doing each activity to enhance embodied engagement to counter the problem in practice. For example, the use of the patient management system to get specific information requires a systematic way of using it:

“In order to understand the complete picture of the situation, you can use the patient management system, which is a very good resource. It also involves a process of activities that should be followed to ensure that the right information is accessed. For example, first I opened the patient management system, and searched for the patient by putting in her last name; then they verified the NHS patient number. This is a unique reference number for every patient.”

(Accident and Emergency department -D24 on 27-06-15)

Within the activity, there is again a micro level organisation of small actions that need attention to enhance embodied engagement, which empowers junior doctors in recognising the problems in practice. As mentioned by D17, first they review the patient’s notes, then they use the patient management system. The use of the patient management system to access the right information again follows a set pattern of actions to remain accurate and problem free in the practice, as mentioned by D24. When they have accessed the right patient information, first they review the most recent investigations so that they can see the most recent developments; they look at whether the patient is getting better, and then at the rest of the medical history. Moreover, this activity of reviewing the patient’s medical history guides them to tailor their history taking questions. The act of tailoring medical history questions or feeling that in the medical history questions an important question was missed can be recognised by following the systematic approach to activities. Such decisions continuously require reflective thinking during the everyday work of the junior doctor. For example:

“...when we review the patient notes, and investigations...we are developing a road map to reach the diagnosis.... Our history questions, examinations and all the discussions with the patient depend on this.”

(Acute Medicine ward-D2 on 23-10-14)

After taking the history, doctors need to examine the patient, and this is a very important activity to enable them to record physical clues; the systematic approach to activities helps junior doctors to recall relevant clues that act as information for the problem recognition in practice:

“The patient is critically sick.... I was just following a systematic examination technique known as ABCDE (airway, breathing, circulation, disability, and exposure) in medicine.”

(Accident and Emergency department -D24 on 20-08-15)

Therefore, to capture the situated clues, the ABCDE technique provides an organised way to be engaged with work and capture relevant information. When I further probed into the way the ABCDE technique works in practice, D24 told me that:

“In the ABCDE guide, it’s not just about checking the airway, breathing, circulation, disability, and exposure of the patient. This guide also tells us how to do this, what to look for and what to do. For example, in the case of breathing (shown in the online database), I need to look, listen and feel for the general signs of respiratory distress: sweating, central cyanosis, use of the accessory muscles of respiration, and abdominal breathing and count the respiratory rate. The normal rate is 12–20 breaths per minute. We continuously ask ourselves whether there is anything I am missing and think about how to manage the patient.”

(Accident and Emergency department -D24 on 20-08-15)

It shows that in the systematic approach to activities guide, the important clues are those that need special attention to perform and those that enable her to keep asking if there is anything she is missing during the practice. It enhances embodied engagement in the workplace and helps junior doctors to capture relevant information to discover whether they are missing something important. This missing aspect of practice, then, points the junior doctor to the problem in practice.

To capture the importance of process and activity flow, the following example from the field notes brings all aspects altogether:

During the ward round, D18 and a colleague were reviewing a patient who had recently been transferred for admission from the emergency department. In the notes from the emergency department's doctor, the query was to rule out COPD (Chronic Obstructive Pulmonary Disease). The notes indicated the patient's severe breathing problem. After reviewing the patient records, D18 came to the patient's bedside. D18 introduced herself and started asking particular questions related to the patient's signs and symptoms. These questions were related to lifestyle, such as the smoking habit and profession of the patient that can influence the lungs problems. D18 took a quick history and did a systematic assessment to check the patient's nose, throat, listen to the chest, measure respiratory rate and checked for any trauma (known as the ABCDE assessment in medicine).

(Field notes: Acute Medicine ward- D18 on 30-06-15)

The information D18 and the colleague collected from the patient notes guided them to ask particular questions, which means that the written information acts as a clue in practice.

Further, when I asked about how she selected particular history questions, D18 said:

“The questions I ask are based on her medical problem and complaint. As the patient is suffering from COPD, which is a critical lung disease that may cause further chest infection and can be intensified with exertions and lifestyle choices such as smoking, I asked relevant questions, and confirm the information from the patient from various aspect according to the situation. Moreover, there is a COPD protocol that tells us what to ask and see, and how to manage the patient.”

(Acute Medicine ward- D18 on 30-06-15)

Now it is clear that the organisation of the history questions used to collect further information are also guided by the systematic approach to activity used to manage COPD and modify it according to the contextual requirements. At that point, D18 had not looked into the COPD guide, but instead evaluated her existing personal knowledge to make judgements, and carried out the physical examination of the patient:

I found the tender, rigid abdomen and asked the nurse to check the blood pressure (95/60), pulse (110) and temperature (36.7 degrees Celsius). When I asked about symptoms such as breathlessness, chest pain, cough, history of weight loss, fatigue, etc., the patient complained about chest pain and I could also see her coughing. At this stage, the evidence I had was not indicating anything different to what I was planning. Let me see the COPD protocol to see if I am missing something? Oh yes, we need to check her current lung strength by blowing air with the spirometry test.

(Acute Medicine ward- D18 on 30-06-15)

The findings show that trying to follow the systematic approach to activities by asking questions like ‘am I missing something?’ And interactions with the context modify systematic approaches to create their theories in use. It enhances embodied engagement and junior doctors’ knowledge to be able to recognise the problem in practice. As in the above example, when the junior doctor assessed the systematic

approach to the activity of managing a COPD patient, she brought her personal knowledge to the next level by knowing that she needed to do a spirometry test. The significance of the enhancement of personal knowledge is that, when a junior doctor asks whether she is missing something, it brings her from retrospective thinking to prospective thinking; i.e., what I can do, exploring various aspects of practice. Therefore, in order to realise the problem in practice, the junior doctor can compare the processes and content of each activity to enhance embodied engagement and her personal knowledge. Moreover, it involves the junior doctor being in retrospective and prospective thinking at the same time to recognise a problem in practice. Thus the systematic approach to an activity facilitates junior doctors in capturing all related clues and deciding what to capture and what to ignore in a complex situation and lead them to realise the problem, related to lack of professional knowledge or lack of information.

The extant literature establishes the importance of the process and content of the junior doctors' daily jobs, the findings thus suggest that junior doctors need to keep asking themselves questions on whether they have all the information they need to perform the task:

- Am I missing something important?
- What can I use (tools and technology) to explore a missing aspect of activity?
- Am I performing the procedures and following the right process without missing any important information?

The findings show that these questions facilitate junior doctors to realise arising problems due to the breakdown of practice.

4.4 Attention to the 'big picture' of practice and the role of social and material resources

Attention to the 'big picture' is essential for junior doctors to recognise the problem in their practice. 'Attention to big picture' means that a doctor makes an

effort to collect relevant information that may help her in an activity. In the hospital setting, there are various resources that junior doctors utilise to access detailed information about the patient, which broaden the junior doctors' scope of embodied engagement from readily observable information to broader, context-related information that needs further action to collect and use in practice. These resources may be the 'patient management system,' patient notes, contacting the previous hospital and/or the general practitioner, and discussing the case with colleagues etc. for more information. The findings of the study show that such use of social and material resources significantly enhances the information that junior doctors use and interpret to recognise the problem in practice. I will discuss the importance of paying attention to the big picture in this section with illustrative examples from the data.

4.4.1 The use of tools and technology: paying attention to the big picture

The effective use of tools and technology, artefacts (material resources), discussions, talks and asking for the opinion of other healthcare professionals facilitates junior doctors in recognising problems in three ways, namely; 1) provides context-relevant information that is not available in the immediate situation; 2) facilitates junior doctors in the interpretation of information; and 3) reveals the 'taken for granted' aspects of practice. For example, in the Accident and Emergency department, a junior doctor (D6) was reviewing a patient who came in with a complaint of severe back pain lasting for one week. The doctor asked about the nature of the pain and other relevant information from the patient and also performed a physical examination of the patient. She noted all the information with her embodied engagement and interpreted that:

"It seems like the patient is sitting longer and her posture is not straight.... That may be causing the back pain..... as she [patient] told me that she works as a software developer.....I should give her painkillers to control the pain, but the patient also has a urine problem, but I am not sure why because she does not have any sign of an infection of the urinary tract. Let me see her medical history."

(Accident and Emergency department-D6 on 03-11-14)

During the embodied engagement in context, she collected information by recording all the possible situated clues and interpreting them, but she thought that it was nothing serious and that she should just give the patient painkillers. One aspect of generating feelings in the practice is that *one should make links and reason how acquired information and observations fit together to guide further actions*. The information she collected appeared limited when D6 was not able to find a reason for the patient's 'urine problem.' At this stage, D6 had a confusing feeling that she must be missing something but was not able to recognise the problem in her practice. The junior doctor was not able to reason and justify the available information as she was not able to see the 'big picture' of the situation. Therefore, she decided to look for more information in the patient management system. D6 found lots of information that gave her guidance on what she should do in this situation, i.e., identification of the problem in her practice.

D6 found that the patient had a long history of psychiatric/mental health issues, of mild cervical spine stenosis and subclavian vein compression by her cervical rib; she had been under [name of another hospital] follow-up for the last two years and was also 'red flagged.'

(Field notes: Accident and Emergency department- D6 on 03-11-14)

This timely use of the patient management system provided further information that advised D6's embodied engagement to focus on exploring clues related to the neurological problems of the patient. Moreover, she understood that the 'red flag' sign in the system might indicate a brain tumour. I asked her the meaning of 'red flag':

.... "the possibility of some brain tumour which is affecting the lower limb..."

(Accident and Emergency department- D6 on 03-11-14)

Now, D6 again went to the patient, again asked a few questions and examined her with a specific focus on exploring the possibility of the ‘red flag.’ She found new evidence to guide her practice:

..... on examination, D6 found she (patient) had marked tenderness around the lower lumbar spine, the power of both legs was 3/4, which D6 felt was mainly because of pain, and the straight leg raise (SLR) test was 60 (as documented by D6).

(Field notes: Accident and Emergency department- D6 on 03-11-14)

Because of the red flag sign that D6 had seen in the system, the significant neurological history, and the abnormal examination, D6 was really alarmed; she performed a further physical examination, asked new medical history questions and generated new relevant information of the context that was missing before. In light of the new information, the interpretation of the clues had also changed. D6 now said:

“I think the patient may have developed a brain tumour that is affecting her urinary nerves. I must request an urgent MRI [Magnetic resonance imaging test].”

(Accident and Emergency department- D6 on 03-11-14)

Paying attention to the big picture, with the help of material resources (the patient management system), provided the junior doctor with new relevant information, empowering her reasoning and judgement of the information, and finally she recognised that she should request an MRI of the patient to rule out the development of a brain tumour. D6 realised that her initial plan to discharge the patient with painkillers was wrong and unsafe for the patient. Hereafter D6 rushed to the consultant with the idea that the patient needed an urgent MRI. So, looking at the ‘big picture’ was facilitated through the use of the patient management system, which helped the junior doctor to realise what she was missing in her actions. The use of material resources (tools and technology) provides a rich and relevant contextual information and broadens junior doctors’ vision when interpreting the

situation. The use of material resources then enhances their capacity to recognise the problems in practice.

Similarly, the combined use of social and material resources is also helpful for junior doctors in recognising problems in everyday work. For example, a case was observed in the emergency department, when a junior doctor intended to ask advice from a colleague on opening the SEPSIS bundle [protocol guide of medical condition] for a patient who was fulfilling all the criteria according to her judgement of available information. She went to her colleague and discussed the supporting evidence for opening the SEPSIS bundle:

Junior doctor- the patient's SIRS are positive, the temperature is 39, and the patient is tachycardic [irregular heart rate]. Should I open the SEPSIS bundle?

D19- wait for a second, let me see the patient's notes before we jump to open the care bundle. [Then she verbalised] look [on computer 'patient management system'] her [patient] lactates are also high, and the patient is not on any medication that may raise her lactates, and her temperature is genuinely high. Moreover, her respiratory rate is high. Let me see her medical history. Ok, the patient already has COPD, and her respiratory rate is high in normal circumstances. Look, here in the SEPSIS bundle it is written that if the patient has any respiratory disease, then we cannot count in respiratory rate as an indicator of SEPSIS. This patient has a previous history of respiratory disease so we cannot count her respiratory rate as an indication of SEPSIS and the criteria are therefore not fulfilled. Hope it helped.

(Field notes: Accident and Emergency department- D19 on 02-07-15)

The above example showed that social and material resources play a central role in recognising the problem in the practice of the junior doctor. The junior doctor was on the verge of following the SEPSIS guide in managing the patient. Therefore,

she discussed the matter with D19. The junior doctor mentioned all the information; i.e., “the patient’s SIRS is positive, the temperature is 39, and the patient is tachycardic”, and so she was reasoning and judging that the SEPSIS bundle should be followed for the patient. D19 considered the information the junior doctor was providing, but D19 also explored further into the patient’s medical history in the patient management system (organisational resources) to analyse the situation. In this process, D19 found further ‘information’ [clues] about the context; i.e., the ‘patient already has COPD, and her respiratory rate is high in normal circumstances.’ The junior doctor took this information as ‘taken for granted’, and had not previously reflected on it. In this situation, both doctors collected more information and revealed the ‘taken for granted’ aspects of practice. After seeing the broader picture of the context, D19 looked at the SEPSIS guidelines meticulously, and they both [the junior doctor and D19] supplemented their personal knowledge of SEPSIS management by using organisational resources; i.e., *‘if the patient has any respiratory disease than we cannot count in respiratory rate as an indicator of SEPSIS’*. The enhanced knowledge strengthens the capacity for reasoning and judgement in the process of the interpretation of information, and they decided not to follow the protocol guideline. Thus, in this example, the junior doctors utilised both social and material resources. This use provided them with relevant contextual information, revealed ‘taken for granted’ aspects, and updated their personal knowledge to reason and make judgements about the potentially problematic situation.

Similarly, consider the following example where a junior doctor revealed the ‘taken for granted’ features of the practice by talking to a senior doctor:

“I clerked a 75-year-old man with a history of falling at home, asked all the possible questions while keeping the differential diagnosis in my mind, and then performed the relevant examination on the patient. I requested the required blood tests for the patient to work up the diagnosis. The diagnosis of the patient was a single fainting episode (vasovagal syncope). After the patient was stabilised, it seemed to me to be a minor case, and the patient was ready to be

discharged. Hereafter, when I discussed the case with the senior, the consultant asked me about the patient's medication, and that completely changed the management of the case. The question was 'is he on warfarin (blood thinner)?' I had no answer for that, as I had forgotten to ask this crucial question about patient medication. On realising that I had missed an imperative thing, I went back to the patient and asked him about it. Unfortunately, the patient had been on warfarin for the last three years for his irregular heartbeat (atrial fibrillation). It changed the whole management of the patient, because if someone is on a regular blood thinner, and has a fall, then the chances of brain bleed are even greater, and they may need a head CT scan to rule this out."

(Accident and Emergency department- D21 on 08-08-15)

In this vignette, D21 involved in her work and collected information that suggested to her that this was a 'minor case and the patient was ready to be discharged.' D21 discussed the case with a senior doctor to be sure that she was not missing anything. However, discussion with the senior fellow revealed the 'taken for granted' aspect of D21's practice, i.e., 'is he on warfarin?' The information that the patient had been 'on warfarin for the last three years for his irregular heartbeat (atrial fibrillation)' completely changed D21's course of action in the management of the patient.

Moreover, the social resources that offer a broader vision of context and recognise the problems in the junior doctors' everyday work are operationalised with the help of organisational tools and technology. For example, during the ward round on the Acute Medicine ward, the junior doctor realised that she was missing some important information needed to understand the situation and this lack of information was making her unsure about how she should proceed and manage the patient:

[.....] D18 looked into the patient's notes and talked to the patient. The patient mentioned that last month he had undergone laparoscopic surgery to remove his gallbladder in [hospital name]

hospital and now he had abdominal pain. D18 talked to other junior doctors and said that “maybe the patient’s current abdominal pain is related to the previous intervention of surgery. If we can get the report on all his treatment from the previous hospital, we may be able to figure out the underlying reason for his pain”.

(Field notes: Acute Medicine ward- D18 on 30-06-15)

D18 was making sense of the current situation, and she wisely thought of getting reports of previous surgical interventions so that she could have a vision of the ‘big picture’ of the current situation. D18 looked in the patient management system to get information on the previous hospital and the doctor’s contact number. Hereafter she called the hospital via the switchboard (hospital recorded phone line with an operator) and spoke to the secretary of the surgeon who removed the patient’s gallbladder. D18 asked the secretary to send the reports. The process of getting the relevant information was operationalised by using the patient management system to find the surgeon’s name and contact number; then switchboard was used to call and keep a record of the conversation. When D18 found the reports from the previous hospital, she realised that a complication had occurred during surgery, and she realised the problem in her actions:

“If the patient has leakage of the gallbladder after the surgery that was again repaired by the surgeon.... It can be possible that the gallbladder again has some leakage..... so I think we should go for an endoscopy.”

(Acute Medicine ward- D18 on 30-06-15)

This information supplemented the information that D18 had already collected by recording contextual clues. Before she received the information about the previous procedure, D18 could not work out how to manage the patient nor could she see what she was missing, i.e., the need to do an endoscopy to see the internal abdominal picture. She was not however stuck in her practice, as D18 explained:

“Without this information [the gallbladder leaked after the surgery], I would have gone on to explore the kidney, lungs and gut problem... those were useless. I will see the endoscopy report later today.”
(Acute Medicine ward- D18 on 30-06-15)

Moreover, the new information (the ‘gallbladder leaked after the surgery’) facilitated D18 in his ability to reason and make judgements on the clues, and that is an interpretation of information. Otherwise, D18 may have had to undertake many extra investigations ‘to explore the kidney, lungs and gut problem’ but these were not the right interventions for D18 to carry out at that stage because, later, when the reports came out, D18 told me that:

“My decision to perform an endoscopy was right; the patient has again developed leakage from the previous surgical scar.”
(Acute Medicine ward- D18 on 30-06-15)

In this vignette, D18 got access to important information by operationalising social resources, material resources, and organisational structure to facilitate her in this endeavour. In the end, she found the problem in her practice and decided that endoscopy should be requested. Before talking to the other hospital and reviewing the previous reports, she could not have decided to request an endoscopy. Thus, keeping a ‘big picture’ in the vision enhances the junior doctors’ ability to recognise problematic practices in a mundane job by providing rich and relevant contextual information, facilitating reasoning and judgements during information processing and revealing ‘taken for granted’ aspects.

4.5 The meaningful comparison with contextual norms of practice

Being critical in practice during interpreting information helps professionals to recognise perplexity in the situation (John, 2009), but how can one be critical in the case of junior doctors when they do not have much professional experience? This is a conundrum. The study suggests that it can be achieved through meaningful

comparison with the contextual norms and theories of practice. The comparison may involve artefacts and/or social dialogues. For instance, a junior doctor mentioned that she standardises her practice by comparing her actions with those of senior fellows:

“I think the whole ward round is a learning experience. I see consultants examining, clerking and managing patients which helps me to standardise my patient management, or I can say, I compare my practice with the consultant’s.”

(Acute Medicine ward-D2 on 21-10-14)

Here, the junior doctor organises her practice by doing the ward round as other senior doctors do. The meaningful comparison of her personal actions with those of the experts facilitates the junior doctor to explore the problems in practice by being critical of her practice during information processing. D2 suggests involving her previously known norm of practice and consciously following them in the everyday work to see if she is going somewhere wrong in her practice.

The junior doctor compares herself by considering her already internalised observations of working with senior fellows (i.e., retrospective thinking) or may ask other colleagues whether she is doing it right (i.e., prospective thinking). For example, in the emergency department, a junior doctor came to D19 for reassurance and advice on using the SEPSIS bundle in patient management. The junior doctor and D19 got involved in a medical conversation, and at the end of the conversation, D19 suggested to the junior doctor that the patient did not fulfil the criteria of the SEPSIS bundle. D19 said:

“Look here, in the SEPSIS bundle it is written that if the patient has any respiratory disease then we cannot count in respiratory rate, and this patient has a previous history of respiratory disease. So we cannot count her respiratory rate as an indication of SEPSIS, and the criteria are not fulfilled. Hope it helped.”

(Accident and Emergency department- D19 on 02-07-15)

The junior doctor realised the problem in her judgement by comparing with D19's judgement on the issue. In this situation, the junior doctor was involved in prospective thinking; i.e., what other doctors think about this situation, and this increased her knowledge by meaningful comparison. After giving this advice, D19 started documenting every point she suggested to another junior doctor, and she also documented the justification for her point of view. At the same time, the other junior doctor said that she did not want D19 to document on her behalf, but still D19 documented everything. It seemed like slightly odd behaviour to me as an observer, because D19 was increasing her workload. She could have decided against documenting, as requested by the other junior doctor. When I asked why she did this, D19 answered as follows:

"I have seen my consultant; she always documents what she suggested and why she suggested something to someone. For me, it is important in two aspects. It keeps track of who does what, and why... enhances the transparency in our work, as we are accountable for what we do. Moreover, I always try to follow the best practices of senior doctors, and I believe it is good to document."

(Accident and Emergency department- D19 on 02-07-15)

D19 involved herself in meaningful comparison with the consultant's practice of recording all information in the patient's notes for transparency. Despite the fact that the other junior doctor did not want D19 to document their discussion, D19 was aware that a lack of documentation could create problems. Therefore, D19 used a meaningful comparison to recognise the problem in the suggested action and tackled it before it escalated in practice.

To establish the significance of prospective thinking in problem recognition, see the following example, where a junior doctor realised that she was not writing patient notes according to the professional practice and needed to learn how to organise information in patient notes. The prospective thinking in meaningful comparison is notably evident in this example:

[.....] I was not writing the name and the patient's GMC no. on every page of the patient's notes. My consultant reminded me many times to write the patient's name and number on every page. It takes a lot of my time to do so, but it is important. [.....] Then one day I started looking at the notes written by the consultants and recorded all the important aspects needed in the notes. I came to know that there is a very specific format and information sequence which was missing in my notes. Since then, I have followed these guidelines when writing patient notes.

(Accident and Emergency department: D7 on 05-11-14)

D7 could not be critical of her practice to realise that she is not writing patient notes in an organised way unless she had seen and compared her notes with other senior doctors' written notes. The meaningful comparison is accomplished by using artefacts, i.e., patient notes were written by a senior fellow. D7's existing personal knowledge was limited, in that she did not know how to organise the information in patient notes.

On the other hand, she collected new knowledge by taking on advice from her seniors and by reading notes. D7 is basically using organisational resources and learning new theories and norms of doing. The new theories and norms are relative to each junior doctor, but the theories are in use across an organisation.

Similarly, the following example shows the use of theoretical knowledge by being involved in prospective thinking to recognise a potential problem in practice, i.e., a missing x-ray report.

"These bundles help us to organise and think in the right direction. I was missing the erect chest x-ray, and if I hadn't seen the protocol bundle, I would have missed it. Now I have requested it; it is also needed because if a surgical unit wants to operate, they will have a better picture of the problem."

(Accident and Emergency department -D4 on 27-10-14)

Such comparison does not just follow others' practice blindly, but gives reason through comparison and looks at the importance of doing to recognise the potential or existing problematic situations. It involves the comparing and contrasting of the practice and situational clues to produce the best possible outcome for the professional practice. As such, D23 mentions how she was comparing her practice with a senior fellow and modifying it according to the problem in hand:

"I have observed Dr XXX prescribing three antibiotics including gentamicin to a patient with the same symptoms, but it was a 23-year-old young man, you see here... I am not prescribing gentamicin as it can affect the patient's kidney, who is 78-years-old, and right now, I don't really know how the patient's kidney is functioning. So, to be on the safe side, I did not prescribe the gentamicin."
(Acute Medicine ward-D5 on 30-10-14)

D5 recognised that although Dr XXX had prescribed gentamicin to the previous patient, it could be harmful to the patient in the current situation, and recognised that it could be a problem in patient management. D5 was involved in interpreting information during the situation and decided with the help of meaningful comparison.

In conclusion, meaningful comparison, on the one hand, is a practice of recalling how theories or other experts deem to act in a similar situation and a comparison with one's own actions. In this process, junior doctors use their existing knowledge of theories and contextual norms in retrospective thinking that facilitates them in interpreting information to make judgements about the problematic situation. On the other hand, it involves junior doctors extending their knowledge of theories and contextual norms by using organisational resources that finally help them to recognise the problem in practice. In this process, junior doctors think prospectively to learn new theories that may be helpful in similar situations or they explore experts' opinions in order to act accordingly in a similar situation. Hence, during the meaningful comparison, junior doctors can critically evaluate their actions and are able to recognise potentially problematic situations in practice.

4.6 Summary

In this section, I provided evidence on various aspects of junior doctors' practice that represent the process of manifestation of mindfulness and information processing to recognise the problem in their practice. The recognition of the problematic situation is a complex process in the junior doctors' practice. The findings show that the personal engagement of the junior doctors during with work initially captured basic clues that empowers them in recalling related knowledge/mindlines. The mindlines is represented in the findings as a systematic approach to activities. At this stage, problems emerge due to unanticipated outcomes or clues on the one hand, and lack of ability to recall related knowledge on the other hand. Subsequently, the systematic approaches enable doctors to organise their search of all related clues and information in the context and maintain mindfulness of details. Further, the existing mindlines also help junior doctors in interpreting the situated clues and articulating problem. At this stage, the problem in practice can be related to lack of information or absence of mindlines. It leads junior doctors to use tools and technology to access further background information that is represented in the finding as attention to the big picture. At the same time practitioners are always involved in the meaningful comparison of their actions and thoughts with that of experts that enable them to recognise the problem in action. Hence the manifestation of mindfulness and information processing during the problem recognition can be represented as the entanglement of four emerging themes namely; 1) personal engagement; 2) a systematic approach to activities; 3) meaningful comparison, and 4) attention to the big picture. As I have shown throughout the Chapter, these four constructs are entangled with each other through a central construct of 'personal engagement' and support each other in a specific way as presented in Figure 4.1.

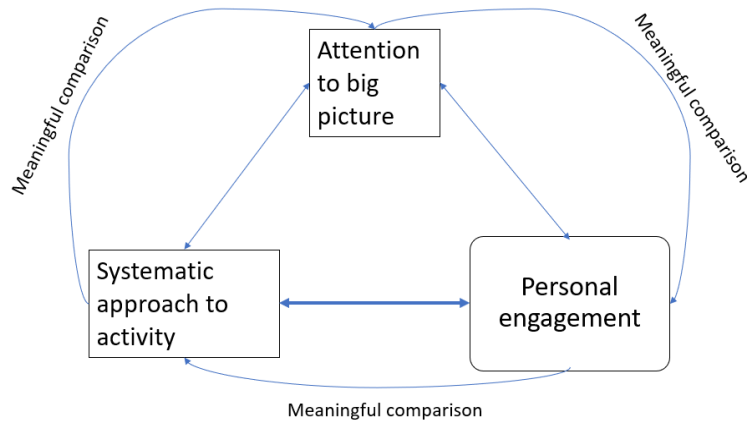


Figure 4-1: The manifestation of mindfulness and information processing in the problem recognition process.

Next, when junior doctors recognise the problem or a confusing situation, it requires remedial actions to solve the problem or situation. In such an endeavour, how junior doctors think and update their knowledge by using social and material resources in the hospital setting will be the focus of discussion in the next section of my findings.

5 CHAPTER 5: WHY AND WHEN THE USE OF SOCIAL AND MATERIAL RESOURCES IN PROBLEM-SOLVING HELPS

5.1 Introduction

In the previous section, I demonstrated that the process of problem recognition in the everyday work of junior doctors is a complex process. When the problem is there; i.e., the junior doctor is feeling ambiguity, or confused or struck in the practice, new understanding and sense-making of the situation is required to solve the problem to overcome a difficult situation. The everyday work of junior doctors is of varying complexity. On the one hand, the junior doctor recognises a problem in practice and uses her knowledge/mindlines to solve the problem by reasoning and justifying the contextual information and takes corrective action with her pre-existing understanding of the phenomenon. Further, there are situations when the junior doctor is not able to reason and justify the contextual clues and information in practical meanings and does not know how to solve and act in such a problematic situation. It indicates that the existing mindlines and understanding of the junior doctor is limited to interpreting the clues and take corrective actions to solve the problem. In other words, it will address the second guiding research question of the study; i.e., *‘How do junior doctors decide When and why to use social and material resources in the midst of their problem-solving process?’*

During the discussion on the use social and material resources, my findings of the study show that when junior doctors (professionals) use social and material resources in their problem-solving process, it supplements their existing mindlines/ knowledge in three ways. First, it helps junior doctors to interpret situated information (i.e., situated clues recorded with embodied engagement) with practical meaning and to manage the problem with thoughtful, responsive actions. Second, it advances the junior doctors’ theoretical and practical knowledge on which they act to manage the problem and adjust her actions. Theoretical knowledge means a ‘set of accepted generalisations to act and behave in a particular situation,’ and practical knowledge is ‘knowing how to act on an accepted generalisation, i.e., knowing how.’

Third, it also increases the likelihood of revealing ‘taken for granted’ aspects of the practice and enhances the effectiveness of thoughtful, responsive actions. Moreover, I will show that these three aspects overlap each other in junior doctors’ everyday work.

To put it broadly, there are many instants in the practice of junior doctors where the existing knowledge/mindlines (Dewey, 1933; Gabbay and Le May, 2004) that provides solutions on which they base their actions to solve the problem appears to be exhausted. The identified knowledge gaps do not represent a general learning need, but rather the specific and precise knowledge that is required there and then in a particularly problematic situation. These knowledge gaps may be due to a lack of tacit knowledge related to embodied knowledge, and/or explicit knowledge of theories, policies and use of tools and technology. The use of social and material resources facilitate junior doctors to build new knowledge during the problem-solving process.

This incremental knowledge that enables the junior doctor to solve the problem is coded as ‘modified and/or new mindlines’ following Gabbay and Le May (2004, 2011). I will discuss the roles of social and material resources to develop modified and/or new mindlines in this section. Moreover, reading the findings of this Chapter, questions may arise on how social and material resources can be used to produce these results, on when to use social resources and when to use material resources, and on defining the organised process of selection of resources in an organisational setting. All of these questions will be addressed in the next Chapter 6 where I will present findings on the process of the use of social and material resources during remedial action.

5.2 Why junior doctors use social and material resources in the problem-solving process.

5.2.1 Interpreting situated information and building ‘modified and/or new mindlines’ to solve the problem

The data shows that intervening use of social and material resources helps the junior doctor in interpreting situation information to solve the problematic, doubtful and confusing situations. The interpretation process includes the reasoning and justification that leads to the actions to solve the problem. For example, in the emergency department, D22 was tasked with managing the case of a 2-year-old child with a history of diarrhoea and vomiting and stable observations (triage notes). D22 went to see the patient, who was accompanied by her mother:

Mum gave a typical history of gastroenteritis; the examination was remarkable [no worrying signs] except the child looked tired and uninterested. Although obvious indications were suggesting that the patient should be treated for gastroenteritis, the 'child's tired and disinterested look' made me uncomfortable. I cannot say why she looks so tired.

(Accident and Emergency department -D22 on 10-08-15)

At this stage, D22's embodied engagement helped her to record aesthetic clues (i.e., the '*tired and disinterested look*') that acted as information. This clue made her feel '*uncomfortable*', and she recognised the problem in her practice. Now D22 was trying to find reason and justification for the '*disinterested look*' of the child. All the other signs and symptoms which sat within D22's existing knowledge suggested treating the patient for '*gastroenteritis*,' but D22 was not comfortable with this treatment. She could not reason with and justify the information by herself, as indicated with "*I cannot say why she looks so tired?*" It indicated that D22's current knowledge or mindlines was limited in interpreting the meanings of '*tired and disinterested look*'.

On the other hand, D22 had uncomfortable feelings. To overcome the uncomfortable feelings, D22 needed to know why the child looked so tired. In response to the uncomfortable feeling, she instantly decided to speak with the '*paediatric nurse*' to ask her opinion. Hereafter, D22 went to the '*paediatric nurse*' and asked:

D22: Don't you think this child is a bit too unwell for a simple gastro?

Nurse: Yes, she is very lethargic. It seems like the child is dehydrated; make sure you do a BM [test on the child] (blood glucose test). Maybe her glucose is low.

(Field notes: Accident and Emergency department-D22 on 10-08-15)

In such use of social resources, D22 learnt 'what can be the meaning of a 'disinterested and tired look'' in a particular situation. Now, D22 can think of remedial action that can explain her uncomfortable feeling; i.e., 'maybe her glucose is low'. D22 replied:

Yes, it might be a low BM, because it tells us that the lower the energy in the body, the less active a patient will be.

(Accident and Emergency department-D22 on 10-08-15)

The junior doctor's use of social resources provided a new understanding of the situation; i.e. that unwell and disinterested looks may be an indicator of low blood sugar in the patient. This new understanding helped the junior doctor to broaden her 'mindlines' to overcome uncomfortable feelings.

Moreover, the confirmation of a newly built understanding of the situation was achieved through active doing. When D22 tested the patient's blood glucose, it turned out to be 2.2. Again, this number has no meaning without doctors' existing knowledge/mindlines:

This is a very low blood glucose level; normally it ranges from 4-6 in a child.

(Accident and Emergency department-D22 on 10-08-15)

This instant talk with the nurse changed the discourse of D22's practice. Before the talking to the nurse, D22 was planning to treat the patient for gastroenteritis; hereafter, she moved to treat the patient for hypoglycaemia. The nurse's advice to check the blood glucose (BM), because a low BM might cause a

patient to look very tired, provided an additional solution to the problem that was constructed with the use of social resources. This assumption was supported and validated by the BM test, and the patient was first treated for ‘hypoglycaemia.’ Thus, junior doctors use social resources that enrich the stock of assumptions to solve the problem in hand. This new mindlines supplemented solution of the specific problem in a given time becomes the ‘modified and/or new mindlines.’ The modified and/or new mindlines guided the junior doctor in taking corrective action, in response to the above situation:

D22 called the nurse immediately, to give the child gel to eat [HypoStop gel: sweetened jelly-like medication to give an immediate boost to the blood sugar] and the patient was transferred to the resuscitation area and was well-managed.

(Field notes: Accident and Emergency department-D22 on 10-08-15)

The nature of D22’s problem/uncomfortable feelings were linked to the clue (i.e., broadly acted as information) that was inculcated through embodied engagement (as I have shown in Chapter 4 in the section on personal engagement) and that fact that D22’s existing knowledge was limited in terms of being able to interpret the clue into professional language. This gap of knowledge was filled by the use of social resources with immediate conversations that developed the junior doctor’s ‘modified and/or new mindlines’ for managing the problem and take action. To explain further the role of social resources in interpreting information and developing a ‘modified and/or new mindlines,’ see the following example:

In the emergency department, D1 was reviewing a patient with a complaint of a painful cyst under her chin. D1 went to see the patient and asked the patient’s concerns. The patient [pointing towards her chin] said that it was very painful and was getting bigger day by day. D1 felt the cyst and looked at it carefully:

It is quite hard to feel, but I don’t know what kind of cyst it is.

(Accident and Emergency department-D1 on 18-10-14)

D1 was not able to articulate the clues she noticed and seeing the cyst provoked the feeling of confusion. The embodied knowledge that was missing in D1 was evidently the cause of the problem. D1 was not able to reason and justify the nature of the cyst; i.e., she was not able to interpret the information that she collected from the feel and look of the patient's cyst. In such confusion over what kind of cyst it was and over how best to effectively manage the patient, D1 came out from the patient bay and looked for a colleague to ask for help. D1 went to a CT1-level junior doctor:

D1 [confused tone]: The patient has a cyst under her chin, but I don't know which kind of cyst is it.

CT1: Ok, a cyst- is it firm? Is it a thyroglossal cyst?

D1: I don't think so... it's not in the thyroid glands; it's exactly under the skin of the chin. The patient also had a pilonidal sinus, but now that is fine.

CT1: Why you think it is related to that? Pilonidal sinus is an entirely different thing on the cleft of the buttocks.

D1: Ya... but now the patient has a cyst under the chin. Can you have a look at it?

CT1: Ya sure; where is the patient?

D1: There, in bay six.

(Field notes: Accident and Emergency department-D1 on 18-10-14)

The problem was associated with the interpretation of information 'feeling and seeing the cyst', i.e., associated with embodied engagement. In the response, D1 decided to talk to a senior fellow; i.e., the use of social resources to interpret what kind of cyst it is and how to manage this situation. Also in the above conversation, the senior fellow (CT1) was trying to motivate thinking by proposing various professional terms like 'thyroglossal cyst' and relating them to the situation to advise D1 on how to resolve the problematic situation.

Moreover, the conversation indicates that D1 does not know the nature of the cyst, nor does she know about pilonidal sinus, which is why she was trying to relate

them each to each other, despite them being entirely different conditions, as mentioned by the CT1. On the other hand, the discussion with senior (use of social resource), i.e., the conversation with the CT1 doctor, provided an immediate knowledge about pilonidal sinus to confirm that it is something on the cleft of the buttocks. D1 learnt about pilonidal sinus, but CT1 was not able to advise on how to manage the cyst at that point and said she (CT1) needed to see the patient's cyst herself. Hereafter, CT1 came to see D1's patient:

D1 starts introducing CT1 to the patient and describes the patient's condition to CT1. CT1 can see and feel the cyst, immediately.

CT1: It is an abscess [an abscess is a painful collection of pus, usually caused by a bacterial infection]; it's firm, tender and painful for the patient. See, it is red... cysts never feel so hard... Cysts are usually relatively soft and flatulent.

D1: Ok then, I need to call surgery to remove the pus.

CT1: I don't think so. It is very small and on the face. It can be managed by giving antibiotics.

D1: The patient just had one course of antibiotic.

CT1: So what? Sometimes you have to take antibiotics for a longer period, after considering the condition of the patient. I don't think surgeons will go for surgery on this abscess; it's very small.

D1: Ya, it seems a reasonable plan. Thank you XXXX [CT1 name].

(Field notes: Accident and Emergency department-D1 on 18-10-14)

In the above conversation, D1 learnt the difference between the feel and look of abscesses and cysts. D1 is learning how to interpret the information gathered through situated clues. D1 is also building on her new mindlines to overcome a difficult situation in the future. The use of social resources provided more solutions to the given situation. This immediate use of social resources enhances the richness of D1's existing mindlines, so it develops a 'modified and/or new mindlines' for that particular situation. The modified and/or new mindlines guide her in how to act in a given situation; that is, the patient just needed antibiotics, and there was no need for

surgery at that stage. Hereafter, D1 came back to the patient, counselled her on the abscess using CT1's advice and prescribed her a one-week course of antibiotics:

There is no need for surgery at the moment; you know it is right on your face, so we will try to sort it with antibiotics first... we can always look at the option of surgery if it doesn't work. [patient looks happy with the plan].

(Field notes: Accident and Emergency department-D1 on 18-10-14)

D1's problem was solved mainly with the timely decision that she needed some help from someone who could tell her about the nature of the cyst. The conversation with the colleague facilitated D1 to interpret clues and take actions to manage the problematic situation. D1's corrective action, prescribing antibiotics and counselling the patient, was influenced by the conversation with the CT1 doctor. Therefore, the use of social resources in hospital settings provides a great opportunity for junior doctors to learn how to interpret situated information and take further actions to solve the problem.

Now I will provide an illustrative empirical example to show the role played by the use of material resources during the problem-solving of a junior doctors' everyday work. In the emergency department at 14:25, paramedics brought in a patient who had suffered a stroke. They told D19 that the approximate time of stroke was 13:00. D19 went to manage the patient. On examination, D19's first observations were:

The patient's right side of the body was very weak, and her facial fall was also indicating severe stroke signs... she [patient] is also on the criteria of SEPSIS, so we need to start the treatment of SEPSIS [that is giving three strong antibiotics and fluids].

(Accident and Emergency department- D19 on 01-07-15)

The situated information collected through embodied engagement guides D19 on two findings. First, that the patient has suffered a 'severe stroke' and two, she is also fulfilling the criteria of SEPSIS. D19 started the treatment of SEPSIS

immediately. Then she started thinking about and managing the stroke. At that stage, D19 was not able to recall the organised way to manage a stroke patient and the immediate treatment needed. In response to this uncertain action plan, D19 went to the computer and had a quick look at the stroke guidelines for managing the patient effectively and safely. D19's decision to use the stroke guidelines in response to the uncertain action plan in solving the problem. This process of using online database stimulated a new idea to solve the complex situation. That is:

In the case of stroke, it is advised to do a head CT scan within four hours to rule out a clot, and if the reason for the stroke is a clot, thrombolysis is the best option. The patient had a stroke attack at 13:00, and now it is 14:45 so the patient is still in the four-hour treatment window. I need to request her CT scan urgently.

(Accident and Emergency department- D19 on 01-07-15)

The use of material resources at this stage provided a reasonable and justifiable mindlines to the situation with the realisation that the patient needed an urgent CT scan. D19 planned to request the scan, and after that, she went to her consultant to discuss the patient. The same thing was picked by the consultant, who asked her to request an urgent CT scan because the patient was in the four-hour treatment window for thrombolysis. At that instant, D19 got confused and told the consultant that she had requested the CT scan, although she had not yet done this.

After speaking with the consultant, D19 realised that she was missing something, and she considered that the patient's medical history would be well informed of the situation. As I have discussed in Chapter 4, that paying 'attention to the big picture' influences the interpretation of existing information and clues and the same happened in this situation. D19 found that the patient had recently been diagnosed with metastatic lung cancer and it had spread to other organs as well. She again started looking into the system, and talked to herself about the thrombolysis:

If the patient has metastatic lung cancer and heart problems, is thrombolysis still an option for such a patient?

(Accident and Emergency department- D19 on 01-07-15)

At this point, D19 was involved in information processing and was trying to interpret, reason and justify her actions. That is, questioning her actions and trying to justify them. The focus had shifted from general stroke management to exploring the consequences of thrombolysis in that particular patient. The clues and information that need interpreting are very specific and technical in nature. That is if a patient has metastatic lung cancer, is she a candidate for thrombolysis? Before going back to the consultant, she looked again into the NICE guidelines on thrombolysis and found out that the patient was not a candidate for thrombolysis because:

..... in thrombolysis, we give medication to dissolve the clot, and it results in very thin blood. So there is a high risk of spreading cancer cells in the body and heart failure during the thrombolysis process. It means the patient is not a candidate for thrombolysis. If she is not a candidate for thrombolysis, then there is no need for an urgent CT scan.

(Accident and Emergency department- D19 on 01-07-15)

The use of NICE guidelines on thrombolysis helped D19 to make the decision to drop the option of a CT scan and thrombolysis. NICE guidelines helped D19 to interpret the situated information and enabled her to direct her actions in the right direction by providing a new solution or new mindlines. In this way, the use of material resources helped the junior doctor to construct a new solution that modified her mindlines and resulted in a 'modified and/or new mindlines.' The use of material resources changed the direction of her actions. D19 went back to the consultant and told her that:

D19: the patient has metastatic lung cancer, and she is not a candidate for thrombolysis.

Consultant: All right, that's good. You keep an eye on everything. Yes, in the patient with metastatic cancer, thrombolysis is very risky. Then shift the patient to the 'Stroke department' [.....].

(Field notes: Accident and Emergency department- D19 on 01-07-15)

After that, D19 called the Stroke department and informed them about the patient, asked them to arrange the bed and transferred the patient. In this vignette, the most important finding is the significant role played by the use of material resources in interpreting situated information and taking corrective actions.

Hence, it is clear from the empirical examples that the implications of social and material resources help junior doctors in interpreting situated information and taking remedial actions by providing a ‘modified and/or new mindlines’ in a given situation. The modified and/or new mindlines is richer and more authentic when compared with junior doctors’ existing mindlines and is derived through the use of the organisation’s social and material resources.

Moreover, the situation dictates whether social or material resources can be more helpful. There are situations when the interpretation of information and further actions are guided through material resources, such as patient records, protocol guides, and artefacts etc., and sometimes social interactions are enough to bridge the understanding gap to solve the issue. However, the findings suggest that if the problem is related to the interpretation of embodied clues and language is crude, we mostly use social resources. On the other hand, if the information is factual, the crudeness of language is minimised, and the problem is clearly defined, we mostly use material resources. I have dedicated a complete section in the next Chapter 6 to this discussion on distinguishing between the use of social or material resources in a particular situation. Further, the use of social and material resources provides rich and authentic theoretical and practical knowledge for the interpretation of situated information and thoughtful, responsive actions, and that will be the focus of the next section.

5.2.2 Provides theoretical and practical knowledge for problem-solving

The findings of the study show that the use of social and material resources instantly provides theoretical and practical knowledge, supplementing junior doctors’ existing knowledge and developing a ‘modified and/or new mindlines,’ to manage the problematic situation and take corrective actions. Theoretical knowledge means a ‘set of accepted generalisations to act and behave in a particular situation,’

and practical knowledge is ‘knowing how to act on an accepted generalisation, i.e., knowing how.’ To illustrate my point, I will first show how the use of social resources provides the junior doctor with the required theoretical knowledge enabling her to build a modified and/or new mindlines for remedial actions. In the accident and emergency department, D20 was reviewing a 9-month-old child accompanied by both parents. The father of the child explained that on the previous evening, he had been playing with her, and she had hit her left leg on the table. D20 examined the child for deformity and bruises. The child was too young to tell where it hurt, so:

D20 was pressing here and there on the left leg of the child and observing the reaction of the child (embodied engagement). However, the problem was that the child was crying all the time, which made D20 confused about where the child was hurting (feelings based on evidence), and on the severity of the injury. Then D20 held the child and tried to get her to walk on the bed; here D20 noticed that the child was not putting any weight on the left leg and was crying with the pain.

(Accident and Emergency department-D20 on 04-08-15)

D20 found evidence with her embodied engagement that it may have been a severe injury because the child was ‘crying with the pain.’ On this D20 says:

“The child is not weight bearing and seems in pain; we need to request an x-ray to rule out a fracture. The severity of pain is a direct indicator of fracture”.

(Accident and Emergency department-D20 on 04-08-15)

At this point, D20 was developing assumptions that perhaps the child had a fracture. She, therefore, requested an x-ray to justify and conclude the assumption, because all contextual evidence was guiding her towards a fracture diagnosis, albeit with her limited knowledge. However, when the x-ray report came back, it showed no fracture. D20 explained her feelings:

*The child is crying with pain, not even putting her foot on the bed....
I don't think I should just send this child home with only a
prescription for painkillers.*

(Accident and Emergency department-D20 on 04-08-15)

D20 had no answer for her clues that indicated a fracture and was doubtful about what action to take. D20 decided to discuss the patient with her colleague:

*D20: The child is not bearing weight completely and is crying with
pain, but the x-ray shows no fracture. Should I just discharge the
patient with pain relief?*

*Colleague: If you think it could be a fracture, you should think of
'toddler fracture'?*

D20: What is it?

(Field notes: Accident and Emergency department-D20 on 04-08-15)

The resulting conversation with the colleague introduced a new understanding that there is a different process to manage a toddler fracture. It indicates that D20 was not aware of toddler fractures, so she inclined to discuss the situation with her colleague. The discussion at this stage indicated D20's lack of theoretical knowledge about the 'toddler fracture.' Later in the discussion, the colleague told her about toddler fractures:

*Colleague: I discussed with my supervisor about toddler fracture
last week. Do you (D20) know that in toddlers, sometimes the x-ray
does not show the fracture because it can be a hairline crack... So if
you think the patient is in pain, I would suggest you treat it as a
fracture to be on safe side. Moreover, ask the patient to come for a
review after three days. In three days, the fracture would have
become more obvious and would appear on the x-ray. If there is no
fracture after three days, just take off the bandage, and there is no
harm in that. But if you send a child home with a fracture and
without a bandage, it is a disaster.*

(Field notes: Accident and Emergency department-D20 on 04-08-15)

The first part of the above narrative showed the colleague giving D20 a theoretical knowledge of ‘toddler fracture’ and explaining that sometimes it does not appear on x-rays. In the second part, the colleague described the potential practical complications for patient management. The purpose of the discussion is not to analytically distinguish between theoretical and practical knowledge; rather, the clear ‘take away’ is that the use of social resources provides junior doctors with the theoretical and practical knowledge that is immediately required in the problematic situation to take corrective actions. Moreover, supplemented knowledge generates a ‘modified and/or new mindlines’ that is used in solving the problem in hand. Now I will provide an illustrative example of building on theoretical and practical knowledge with the use of material resources in the everyday work of junior doctors.

The material resources in hospital settings can be guidelines, protocols, policies, books, and online databases etc., which are used to update junior doctors’ specific knowledge, and which are directly related to the situation in hand. For example, in the Acute Medicine ward, a patient was transferred from A&E to allow the management of severe spinal pain after an injury. The injury resulted in a fracture of the spine. D18 examined the patient and took a history. D18 asked the patient about the nature of the injury and the pain. The patient complained about the very severe nature of pain, which was keeping her bed-bound. On examination D18 found:

She is not even letting me touch her back; I think she is having an 8-9/10 level of pain. There must be some serious problem. Maybe her fracture is getting worse; I should check the previous management of her spinal fracture.

(Acute Medicine ward-D18 on 30-06-15)

D18 checked the patient’s medical record and found an old x-ray, indicating multiple fractures of the spine. The patient’s GP was treating the patient for nerve compression as a cause of the patient’s back pain. At this point, D18 felt the need to see guidelines for the management of spinal fractures:

Let me see in the guidelines on how thoracic spinal fractures can become complicated. The pain of the patient is a worrying sign for me.

(Acute Medicine ward-D18 on 30-06-15)

Here, the point is that D18 knows that the problem is related to the thoracic spinal fracture, but wants to explore how thoracic spinal fractures can become complicated. The confusing issue is how to manage the thoracic spinal fracture; this is the defined nature of the problem. The knowledge gap is very specific and objective, so she wanted to read the guidelines. She gave a good 5-7 minutes to read all the possible complications at <http://orthoinfo.aaos.org/>. After reading, D18 built on her knowledge base and said,

See, the GP is treating the patient for nerve compression, but the guidelines clearly told me that in nerve compression, there is a moderate pain level and the sensation of body parts may be affected. Now, in the patient, a lower limb is not working properly.... Ok it indicates a problem with the nerves... but severe pain indicates some serious underlying issue. I think she must need an MRI [Magnetic resonance imaging] to see what's going on. But I need to discuss the plan with the senior doctor.

(Acute Medicine ward-D18 on 30-06-15)

The use of online guidelines (material resources) provided the junior doctor with an assumption to think that nerve compression may not be causing the severe pain, so she acted to explore further by requesting an MRI. The learning of theoretical knowledge and then immediately thinking about how to implement it in a practical situation in her thoughtful, responsive actions is directly associated with the use of material resources by the junior doctor. The newly-absorbed knowledge provided D18 with a 'modified and/or new mindlines' on which to base her remedial actions.

D18 told the senior doctor that the patient had a spinal injury one month ago, had multiple fractures and now has severe pain in her back. He told the senior doctor

that he didn't think it was due to nerve compression and believed that something serious was going on. The senior doctor agreed with the plan, and later that day when the MRI report came, it showed a bone infection, for which the patient was subsequently treated.

In conclusion, the use of social and material resources immediately provides the required knowledge to the junior doctor to manage the problem in practice. When the junior doctor faces a confusing, uncertain situation and/or is stuck in practice due to a lack of theoretical and practical knowledge, the use of social and material resources bridges the knowledge gap and provides a new mindlines to the existing problem. The added mindlines is derived through the use of organisational, social and material resources, expanding the knowledge of the junior doctor, that is active in the problem-solving. These new mindlines broaden the solutions of the junior doctor, and it results in a 'modified and/or new mindlines.' The modified and/or new mindlines is rich and valid in a particular situation and facilitates the junior doctor in problem-solving of. Thus, the use of social and material resources plays a vital role in providing the required knowledge to junior doctors in the thoughtful problem-solving process. They also help junior doctors to reveal the 'taken for granted' aspects of practice, which will be discussed in the next section.

5.2.3 Revealing 'taken for granted' aspects during problem-solving

The findings of the study show that the use of social and material resources is a very effective tool to expose the overlooked or 'taken for granted' aspects of the practice. In this section, I will demonstrate how the use of social and material resources reveals the 'taken for granted' aspects of practice; consequently, it facilitates the junior doctor in problem-solving. For example, two junior doctors (D18 and CT2-level doctor) were doing a ward round on the Acute Medicine ward. They have the following conversation while examining a patient:

CT2-level doctor: The patient presented with a history of falls and minor loss of consciousness; I don't understand why nobody has requested a CT head [x-ray computed tomography scan] for the

patient. We should be requesting it as soon as possible to rule out brain bleed.

D18: Hmm.... See [looking at patient medical history in the computer], the patient has ongoing treatment of multiple problems. Here.... due to excessive alcohol consumption, the patient's kidney function is very poor... even at the bottom line.

CT2: Ya, I know that, but now I am concerned about her brain bleed, not her kidney.

D18: If we request a CT scan, the radiologist will give her a contrast dye. You know this contrast can badly affect the function of the kidneys, and further worsen the condition of the patient.

CT2-level doctor: Ya, maybe you are right, but how can we ignore the possibility of a brain bleed? [she again has a look on the system to see the patient's kidney function reports]. We should discuss the contrast dye side effects with the radiologist.

(Field notes: Acute Medicine ward-D18 on 29-06-15)

The CT2-level doctor overlooked the potential interaction between the planned action [CT scan] and the existing condition [poor kidney function]. Consequently, she was planning a CT scan that could be harmful to the patient. CT2 considered this information as 'taken for granted,' but D18 pointed out that the patient's kidney function was already on the bottom line and that it may be worsened by the 'contrast dye' of the CT scan. The response of the other doctor that "it is right, but how can we ignore the possibility of brain bleed" indicates that the CT2 doctor was unaware that contrast dye might damage the patient's kidney. The CT2 doctor was ignoring considering these features of practical problems. When D18 highlighted it, the CT2-level doctor decided to discuss the issue with the radiologist, to understand how the contrast dye may affect the patient's kidneys; i.e., the 'taken for granted' aspects are revealed, and further action was generated to clarify the situation.

Subsequently, the CT2-level doctor moved to the nurses' desk to call the radiologist. During the call, the registrar mentioned the patient's general symptoms and suspected problems to the radiologist. During the discussion, she mentioned that

the patient's kidneys were not working properly and that a patient is an old man of 78 years. The call ended, and the radiologist told the CT2-level doctor to wait while she discussed the patient with the consultant. After the call, the CT2-level doctor told D18 that:

CT2-level doctor: The radiologist was asking too many questions; I think she is establishing the need for the scan. The radiologist keenly asked specific questions about the patient's kidney function and said in this situation, when the patient's kidneys are already affected and not functioning properly, the contrast dye used in the CT scan can damage the kidneys, and it can result in fatal heart failure. Now, the important thing is, if you (CT2-level doctor) request the CT scan, how will it benefit patient management; are you planning to go for brain surgery? I (CT2-level doctor) am not sure about it.

D18: The patient is 78 years old, and I don't think surgery is quite suitable for her keeping her current well-being in mind.

CT2-level doctor: Yes, you are right... her body is not ready for brain surgery. No problem. The radiologist told me that she would discuss the patient with her consultant and call me back.

(Field notes: Acute Medicine ward-D18 on 29-06-15)

At this point, things became clearer in the mind of the CT2 doctor, by focusing on the purpose of the CT scan. They both thought about the possible implications of the CT scan intervention in patient management and concluded that surgery was not a viable option for the patient. The 'taken for granted' aspect of practice; i.e., *contrast dye may affect the kidney functions*, was revealed by the use of social resources.

On the other hand, they were still waiting to get advice from the radiology consultant to be sure that what they were thinking was on the right track. The junior doctor was trying to legitimate her assumptions and justification of contextual clues and best possible actions in a given situation. After 15 minutes, they received a call

from the radiology department, and the CT2-level doctor talked to the radiologist. After the call, CT2-level doctor told D18 that:

She [radiologist] was discussing the same point and asking why do we need a CT scan and strongly suggested not to go ahead with the patient's CT scan. Yes, you (D18) are right; it is not very important to have a CT scan of the patient in this situation [...].
(Field notes: Acute Medicine ward-D18 on 29-06-15)

This was a good example to evidence the importance of the use of social resources in revealing 'taken for granted' aspects and managing the complications of the situations in junior doctors' everyday work. After five days of this fieldwork, I came across D18 on 04-07-2015 during my fieldwork and had an informal chat. She mentioned to me that, "*the patient got well the next day and she was walking and eating as she should be and went home. It indicated that she did not have a brain bleed; that day we did the right job for her*". This is the testing of proposed solutions, which validates the assumptions for future use as well.

This whole vignette shows that every question in the mind of the junior doctor needs more than just individual thinking; it involves thinking, the use of available social resources and doing, all at the same time. Only then, can the junior doctor uncover the 'taken for granted' aspects of practice in hospital settings and interpret them to solve the problem, as in this case? Now, I will show how the use of material resources facilitates junior doctors to reveal the 'taken for granted' aspects of practice and act accordingly.

In the emergency department, D23 was reviewing a 24-year-old female (patient) who presented complaining of fits. D23 asked the nature of the fits and examined the patient:

"There is an obvious sign of tongue biting; her [patient] body is rigid due to recent fits... moreover, the patient has a history of epilepsy... hmm, I think it is a clear case of epilepsy."
(Accident and Emergency department-D23 on 15-08-15)

On examination, D23 found situated clues and the nature of the fits guided her towards epilepsy. Furthermore, when D23 checked the patient's records in the patient management system, to her surprise, she found that the patient is already on medication for epilepsy, but is not diagnosed as epileptic. This raises concern, as D23 mentions:

Why hasn't the patient been given a proper diagnosis yet? It can be fatal if she drives, and we [doctors] need to advise the patient to inform the DVLA [Driver and Vehicle Licensing Agency] that she should not drive. I just need a CT scan to confirm the patient's epilepsy. I should request the CT scan for the patient.

(Accident and Emergency department-D23 on 15-08-15)

At this point, D23's confusion is the result of seeing the big picture of the current situation. The use of the material resource, the 'patient management system', provided further information to interpret the contextual clues to realise the problem in her actions. The recognised problem is that the patient should not drive if she is epileptic, but why hadn't she been given a proper diagnosis? D23 could diagnose by arranging one CT scan. Hereafter, the question in D23's mind, on why the patient had not been diagnosed, motivated her to check the patient's medical history further. D23 checked the patient record again and noticed that the patient was already being examined by the GP and by a psychiatrist. This information made her more doubtful:

If the patient is under treatment with the GP and a psychiatrist for the same problem of fits, and they did not diagnose her as epileptic, then there may be something I am missing.

(Accident and Emergency department-D23 on 15-08-15)

The further information that the patient is being treated by the GP and by a psychiatrist raised a doubt in her own assumption and judgement of the situation. Further reading of the patient's record and her psychiatrist report showed that the patient was also suffering from a bipolar mental disorder. This was the 'taken for

granted' aspect of practice, of which she was ignorant. It provided another direction to take, due to new information:

... if she [patient] has a bipolar disorder, perhaps the patient has faked the fit in front of her GP to get attention. Ok, she has bruises on the tongue, her body was rigid while fitting, and there was a loss of consciousness. Ok, these all indicate epilepsy. On the other hand, her bloods [blood test report] are absolutely fine, her white cell count is normal, and troponin was fine. There should be some indication in the blood if there was a fit. I was thinking about how both the GP and the psychiatrist can be wrong when they can see the obvious signs of epilepsy. It means the patient is fabricating fits due to her bipolar mental disorder.

(Accident and Emergency department-D23 on 15-08-15)

The information revealed in the psychiatrist report entirely changed the interpretation of the situated clues and information and D23's actions. Therefore, D19 decided to discharge the patient with a request to her GP to get her a CT scan, to confirm whether she has epilepsy. If so, then ask the patient to inform the DVLA. The doctor was then able to relate to why the GP and other doctors had not tagged her for epilepsy, because of her bipolar disorder. Still, there were two options to proceed:

"Should I admit the patient to get her a CT scan and tag her as epileptic if indicated in the SC scan, or advise the GP to arrange the CT scan.... I think the patient is healthy and medically fit... moreover, I did ask her not to drive anyway ... There is a scarcity of beds on the ward, and the patient is medically fit to go home".

(Accident and Emergency department-D23 on 15-08-15)

The use of available material resources helped her interpretation of the situation and thoughtful responsive actions to achieve effective results. Before the information on the bipolar disorder condition of the patient was revealed, the junior

doctor was planning to admit and request a CT scan but ended up discharging the patient, with a note to the GP to arrange a CT scan if she required. In this particular situation, the confusion and problem were resolved by carefully reading the patient record in the patient management system; it facilitated the junior doctor's knowledge about the behaviour of the patient with a bipolar mental disorder, and D23 was able to take corrective actions according to the situation requirements. Every decision made by the junior doctor was based on evidence. In summary, the use of social and material resources helps junior doctors to reveal their 'taken for granted' aspects in everyday work and solve the problem.

5.2.4 Temporal importance of the use of social and material resources

In the discussion as mentioned above, I showed that the use of social and material resources facilitates junior doctors in 1) interpreting situated clues; 2) learning the new theoretical and practical knowledge that is immediately required in a given situation, and 3) revealing 'taken for granted' aspects. There is significant importance in the use of social and material resources in problem-solving. First, I want to clarify that it is the instant use, not just a use of social and material resources, because every time the social and material resources are used, there are doubts, confusions and/or problems in practice. The junior doctors use social and material resources in a deliberate effort to manage the problematic situation. The use of social and material resources indicates that they are used in response to some problems and amid practice.

Second, the instant use of social and material resources is helpful to learn the interpretation of situated clues as they cannot be created in 'after the moment' discussions. Retrieving from the above examples, the 'unwell look of the child,' and in the case of the cyst etc., the situations are bound in time and space, indicating the best use of social and material resources should be instant in nature.

Third, the use of social and material resources enhances the effectiveness and safety of patient management in the junior doctors' everyday work, as it broadens the active knowledge of the doctor. Moreover, the use of social and material resources gives access to junior doctors to novel situations and an opportunity to learn new

things. If junior doctors do not intend to use social and material resources, they will have to pass the task to a senior doctor to manage the difficult patient and will, therefore, have lost the opportunity to experience the novel situation, resulting in less experience and less learning for the junior doctors. Thus, the temporal use of social and material resources is significantly important in problem-solving, particularly for junior doctors in a hospital setting.

5.3 When to use social or material resources

5.3.1 The use of material resources when the problem is sophisticatedly defined

The findings of the study show that the decision of selecting social or material resources is driven by the interaction between the contextual problem and the junior doctors' existing knowledge in information processing. Moreover, the effectiveness of the utilisation of social and material resources in problem-solving can be assessed by keeping the junior doctors' objectives in mind. Interviews and fieldwork provided me with an understanding of junior doctors' aims in a hospital setting. During the interview, I asked various questions to explore the aims and objectives of the junior doctors in training, such as, what is your main goal in training and what do you want to achieve from your job? Different doctors responded differently. For example:

“My objective is to practice safely and to learn in a way that no one gets harmed due to my negligence.” *Interview: D22, 10-08-15)*

“It is my dream to work as a doctor and see myself curing sick people. That is only possible when I work hard in my training, and learn to be an independent doctor.” *(Interview: D4, 27-10-14)*

“I want to complete my training and meet its requirements successfully; it can only be possible when my supervisors and senior doctors are happy with my performance.”

(Interview: D9, 10-11-14)

In summary, junior doctors explained that their practice objectives are twofold. First, practising in accordance with the standards of the NHS, so that no one gets harmed, and second, maintaining a good reputation in the department so that they can successfully complete their training and become independent doctors. The aim of becoming an independent doctor is also stressed in the NHS training curriculum of foundation and core training (2014). It indicates that the propensity towards the use of material resources is considered as a way to develop a high level of expertise and a good reputation in the workplace. So pragmatically, junior doctors first focus on using material resources if possible, by evaluating the nature of the problem in a specific context. Keeping the junior doctors' objectives and the hospital working context in mind, I analysed the data to explore the underlying assumptions of selection between social and material resources.

The findings show that the selection of material or social resources in a given situation depends on the nature of the problem and the knowledge of the junior doctor. I will show from empirical evidence that the interaction between the nature of the problem and existing knowledge in information processing guides the junior doctor to select either material or social resources in a specific situation.

The findings show that when the problem arises in practice, junior doctors consciously make an effort to analyse the problem and define the nature of the problem and learning needs to manage the problem. In a situation where, junior doctors are able to define the nature of the problem in a sophisticated way, i.e., with professional language, they use or should intend to use material resources. For example, the use of material resources was observed in the situation where junior doctors come across a specific medical condition and are unaware of how to manage the situation.

In the emergency department, D20 grabbed the next set of patient notes from the tray and immediately noticed 'Charles Bonnet syndrome' was written in the past medical history section of the patient's notes. Her facial expression looked clueless. Meanwhile, a nurse came by and said that a 19-year-old boy needed reviewing

immediately as the patient was irritable in the waiting area. D20 held the patient notes and moved to her colleague:

D20: Can you please review this patient; the staff nurse was saying he is not feeling well.

D19: Are you busy?

D20: No, but I have no idea what 'Charles Bonnet syndrome' is.

D19: I don't know either. Anyway, give me patient notes, and I will see him. (D20 left the ED; I shadowed D19) I really have no idea what it is; let's see how the patient is.

D20 went to see the patient, and examined her:

While I was talking to the patient's carer, I noticed that the patient was not looking at me while talking to me and didn't follow my finger during the eye examination. That's why I asked the carer about the patient's vision, ... basically the patient couldn't see properly. I need to see what 'Charles Bonnet syndrome' is.

(Accident and Emergency-D20 on 05-08-15)

The above discussion the problem surfaced in D20's practice; she left the ownership of the problem to D19 and missed the opportunity to learn by use of social and material resources to solve the problem. On the other hand, even though D19 was also unaware of Charles Bonnet syndrome, she decided to manage the problem and decided to see the patient. D19 examined the patient, and there were contextual clues that remained unreasoned and unjustified in the situation, such as 'why the patient didn't follow her finger during the eye examination.' Moreover, when evaluated with her knowledge base, D19 was clearly able to define the nature of the problem in professional language, looking at what she needed to know to manage the current problematic situation; i.e., what is Charles Bonnet syndrome? Therefore, D19 took a decision to read about the signs and symptoms of Charles Bonnet syndrome, as indicated by 'I need to see what Charles Bonnet syndrome' is.'

After this, D19 came to the doctors' office, and she asked one of her CT1 (Core Trainee year 1) colleagues if they had a clue what Charles Bonnet syndrome is. The colleague had no idea either. D19 told me that:

I already knew that she (colleague) didn't know about this; it is a very rare condition. I just wanted my colleague to realise that I was managing a difficult and interesting case.

(Accident and Emergency department-D20 on 05-08-15)

It is the process of building a good image with colleagues by telling them what she can manage by herself. After that, D19 searched for Charles Bonnet syndrome on the internet; she meticulously selected the website www.nhs.uk and read about it for a few minutes. After reading, D19 found it interesting and said:

Now she could relate the patient's vision problems with her condition. Now she examined other missed aspects of the physical examination. D19 also found that there is no specific medication for such patients, but we can use the medication we use for epilepsy, Parkinson's disease and dementia, which have proved effective for some people. D19 also learnt that for such patients, the most important thing is to reassure the patient that it is not a mental condition, it is a vision problem, and she will be all right.

(Accident and Emergency department-D20 on 05-08-15)

The selection of material resources was guided by D19's ability to articulate the situated clues and defining the problem in professional language, where D19 evaluated the nature of the problem with her knowledge to know what kind of knowledge she needed to manage the situation. After this decision, she used an online database (material resources) and was able to supplement her knowledge. It provided D19 with a 'modified and/or new mindlines' to manage the problematic (unknown) situation. These kinds of examples in empirical data provided me with a hypothesis that, 'when junior doctors are able to define the nature of the problem and

the nature of knowledge required in the sophisticated language in a given situation, they use and should use material resources.’

On the other hand, I found some examples that contradicted my hypothesis and showed that even when the problem was sophisticatedly defined, the junior doctors used social resources. For example, D1 was examining a 5-year-old patient with an injured finger. D1 asked about the mechanism of injury, which was ‘finger crushed in a drawer’. Looking at the injury and the mechanism of injury, D1 felt that:

“The injury is very deep, so maybe there is a fracture.”
(Accident and Emergency department-D1 on 19-10-14)

D1 requested an x-ray to rule out a fracture. The x-ray showed a fracture. Now the confusing point was:

The finger is fractured, and her [patient] nail is also damaged. Should I manage the fracture as a normal fracture or as an ‘open fracture’? There is different management of open fractures, but in the books, the open fracture is where the skin is damaged, and you can see the bone as well. I cannot see the bone, but the skin is damaged... I had better ask a senior.
(Accident and Emergency department-D1 on 19-10-14)

In this situation, the problem is defined clearly in professional language; i.e., ‘is it an open fracture’, but D1 intended to use a social resource (I had better ask a senior). It was contrary to my hypothesis that ‘when junior doctors can define the nature of the problem and the nature of knowledge required in the sophisticated language in a given situation, they use and should use material resources’. Hereafter:

D1 goes to the senior doctor and after explaining the mechanism of injury, tells her that the child’s finger is bleeding and that her nail is also damaged. Should I consider it as an open fracture or a simple fracture? The senior doctor came with D1 to see the patient’s wound and told her that it is an open fracture. Then D1 managed the patient

by following the protocol for an open fracture. D1 then called the orthopaedic clinic to book the follow-up appointment to check that the child's finger is fine.

(Field notes: Accident and Emergency department-D1 on 19-10-14)

This sophisticatedly defined problem (open fracture) was managed with the use of social resources. The one other difference was that this example above involved embodied skills. That may be the reason for this change in the use of social or material resources in problem-solving. However, this confusion was resolved by another example where a sophisticatedly defined problem involved embodied skills but the junior doctor used material resources to create a ‘modified and/or new mindlines’ and take corrective actions. This case involved a patient with a complaint of pain in the eye. The patient was a ‘welder’ by profession and was examined by D24:

D24 examines his [patient] eye with the help of a torch.

D24: Do you use eye protection during welding?

Patient: I always use eye protection while welding.

D24: Is there any recent injury?

Patient: No, not really.

D24: Checks his eyesight and that is fine too. Then he puts some liquid in his eye and then again examines his eyes, and finds some unknown damage.

(Accident and Emergency department-D24 on 27-06-15)

At this stage, D24 has seen some damage but does not know what it is nor how to manage this condition. This problem is also related to embodied knowledge, but D24 has some hints about the condition and she gets involved in interaction with the nature of the problem and her knowledge to define the nature of the missing knowledge:

“I don’t know much about this condition, but I can remember that there is some eye condition particularly related to the welding

profession.” D24 goes to the computer, and searches ‘welder’s eye’ and see the images of welder’s eye. The impression of D24 is that yes, here it is. To her surprise, in Google images, she finds exactly the same kind of eye injuries. D24 opens the search page and finds that this condition is called ‘corneal flash burn.’

(Field notes: Accident and Emergency department-D24 on 27-06-15)

D24 has little knowledge about the eye problem, but she got help from material resources to further refine her language to define the nature of the problem. At first, she used an online database (material resources) to refine her language, to work out what the problem is called. For this purpose, she made some effort and used a material resource (computer: online search) to define the problem. In this process, D24 was able to bring more sophistication to defining the problem and the knowledge required to solve the problem. Hereafter, D24 read about ‘corneal flash burn’ in the NICE guidelines (material resources), constructed a ‘modified and/or new mindlines’ and planned for patient management. Then she discussed the complete management with her consultant in confidence, maintaining the safety of the patient and her good reputation as well. She took responsive actions in the problematic situation that was sophisticatedly defined after some action, i.e., how to manage ‘corneal flash burn,’ with the help of material resources. Here D24 learnt the embodied knowledge through the use of material resources.

This indicated that my hypothesis that, ‘when junior doctors are able to define the nature of the problem and the nature of knowledge required in the sophisticated language in a given situation, they use and should use material resources,’ is pragmatically valid. In the previous example, which contradicted my hypothesis, we can see that this was due to the junior doctor’s (D1) lack of ability to learn from her experience. D1 also missed an important learning opportunity to make judgements in the situation, because when she asked the senior doctor to judge whether it was an open fracture, she did not practice her judgement skills. D1 could have used the online resources to resolve her confusion, just as D24 did, and then discussed it with her senior with confidence, thus maintaining her good reputation. To support my argument, during my analysis I searched for the term ‘finger open fracture’ and saw

the Google images. It was to my surprise that I saw similar injuries and could relate to the situation (one image from this search is given as an example).



Hence, ‘when junior doctors are able to define the nature of the problem and the nature of knowledge required in the sophisticated language in a given situation, they use and arguably should use material resources to construct a ‘modified and/or new mindlines’ and modify their actions.

5.3.2 The use of social resources when the problem is crudely defined

The findings of the study show that during the everyday work of junior doctors, there comes a problematic situation when junior doctors cannot be clearly articulate why the situation is not making sense. It is due to the limited knowledge of junior doctors related to the specific problem in hand. In such a situation, they are not able to define the problem in professional knowledge, and their language remains crude when articulating the missing bit of information or knowledge. For example, in the emergency department, D20 was managing a 9-month-old child who came in with a leg injury, and on examination, she was expecting a fracture. D20 requested an x-ray, but the x-ray showed no fracture. It was surprising for D20 because she observed that:

“The child is not weight bearing and seems in pain; the severity of pain is a direct indicator of fracture.”

(Accident and Emergency department-D20 on 04-08-15)

The x-ray findings did not support her observations. At this stage, D20 was completely clueless about the nature of the problem. She was not able to define the nature of the knowledge she required to justify the situation. It means that her language was crude in defining the problem in hand, due to limited personal

knowledge related to the situation. D20 decided to discuss the patient with her colleague:

D20: The child is not bearing weight completely and is crying with pain, but the x-ray shows no fracture. Should I just discharge the patient with pain relief?

Colleague: If you think it could be a fracture, you should think about 'toddler fracture'?

D20: What is it?

(Field notes: Accident and Emergency department-D20 on 04-08-15)

Here the first step towards solving the problem was the use of a social resource, i.e., a discussion with a colleague. Next, with the help of D20's and the colleague's collective knowledge, they refined the definition of the problem in hand. They were able to define the problem as being a 'toddler fracture'. D20 needed to manage the situation as a 'toddler fracture'. Once D20 had learnt that the justification of the situation was a toddler fracture, she had a clearly defined problem. At this stage, according to my previous findings of the use of material resources, D20 could use the online database to find an answer to what it is and how to manage the situation. However, in this situation, D20 asked her colleague about 'toddler fracture' and was told:

Colleague: I discussed with my supervisor about toddler fractures last week. Do you (D20) know that in toddlers, sometimes the x-ray does not show the fracture because it can be hairline crack... So if you think the patient is in pain, I would suggest you treat it as a fracture to be on the safe side. Moreover, ask the patient to come in for a review after three days. In three days, the fracture would become more obvious and would show on the x-ray. If there is no fracture after three days, just take off the bandage, and there is no harm in that. But if you send a child home with a fracture and without a bandage, it is a disaster.

(Field notes: Accident and Emergency department-D20 on 04-08-15)

In this way, D20's personal knowledge was supplemented with the help of organisational social resources, and she created a 'modified and/or new mindlines' to solve the problem. Therefore, she treated the patient for a toddler fracture. Coming back to my previous point, D20 could have used material resources at the stage when she knew that it was a toddler fracture according to my findings, and this has twofold benefits. First, the use of material resources can eliminate possible human error in communicating factual scientific knowledge. Second, it can positively influence the junior doctor's ability to work independently. So, when junior doctors are able to define the nature of the problem and the nature of knowledge required in the crude language in a given situation, they use and should use social resources to create a 'modified and/or new mindlines' and solve the problem.

The use of social and material resources in junior doctors' problem-solving process is dependent on the sophisticated/crude definition of the nature of the problem and the required knowledge. The following example further clarifies it. A patient comes into the emergency department complaining of itching and with painful rashes on the body:

D11 looks at her [patient] rashes on the body. The junior doctor told the patient very honestly that she had 'never seen these before, and I don't know what it is' and mentioned to the patient that she wants to show the rashes to another senior doctor.

(Field notes: Accident and Emergency department-D11 on 14-11-14)

At this stage, D11 has no idea what kind of rash it is or how to manage it. Moreover, there are hundreds of various kinds of rashes and different management plans, so she cannot go for material resources. Therefore, D11 selected to use social resources. D11 went to her senior fellow doctor because she had no idea about the nature of the rash she was planning to manage. The problem was crudely defined in the professional language. D11 went to a senior fellow and asked for help. The senior doctor went with D11 to see the patient:

A senior doctor took one look at the rash and said, 'pityriasis rosea rash'. The senior doctor was aware of what it was but was not sure

how to deal with it. The registrar Googled the term in front of the patient, telling the patient that she wanted to show her different pictures of these rashes. The patient was happy while looking at similar kinds of rashes. Meanwhile, the registrar and the junior doctor looked at the management of these rashes and simultaneously explained the management plan to the patient.

(Field notes: Accident and Emergency department-D11 on 14-11-14)

In this example, it is clear that D11's crudeness of language in defining the nature of the problem leads her to the use of a social resource (help from a senior colleague). Moreover, the first step towards solving the problem was clearly defining the problem in hand with collective knowledge; i.e., the senior doctor's knowledge guided them to the fact that it is '*pityriasis rosea rash*'. Now, the problem was clearly defined. The senior fellow was not able to recall the management of '*pityriasis rosea rash*'. At this stage, the problem is now sophisticatedly defined in terms of how to manage '*pityriasis rosea rash*', and they use a material resource (online database) to adjust and modify their actions and manage the patient safely and effectively.

5.4 Summary of the Chapter

In this Chapter, I discussed the role of the use of social and material resources to manage problematic situations and thoughtful, responsive actions to these situations. In other words, I examined the role and the use of social and material resources in the problem-solving process by the junior doctors. The use of social and material resources is helpful in a situation when junior doctors:

- 1) may not be able to interpret the situated clues and information into a practical meaning.
- 2) lack the theoretical and/or practical knowledge required in the problematic situation and thoughtful, responsive actions; and
- 3) reveal the 'taken for granted' aspects of practice.

Moreover, the use of social and material resources instantly provides theoretical and practical knowledge to handle the problematic situation in everyday work. The addition to the knowledge is due to the instant use of available social and material resources providing doctors with a modified and/or new mindlines that is most relevant to the problem. Therefore, the knowledge used by junior doctors' problem-solving is not the individual knowledge of the junior doctor but rather the knowledge that can be drawn from the social and material resources.

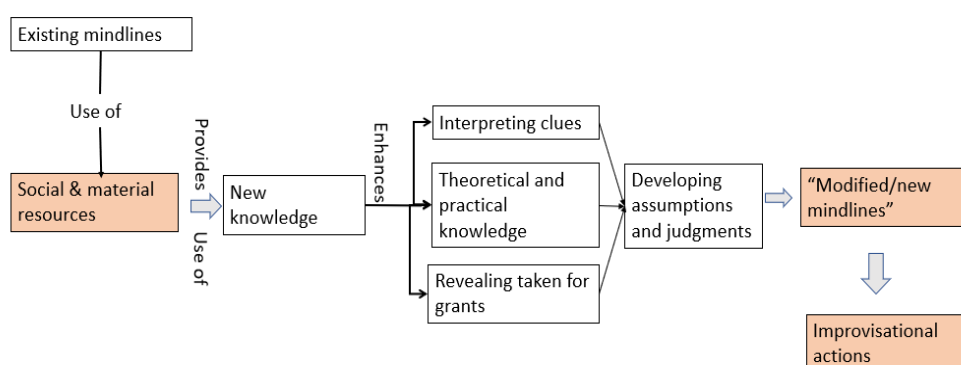


Figure 5-1: Why junior doctors use social and material resources in the problem-solving process.

In this Chapter, I demonstrated that both social and material resources could be used by the junior doctors in the problem-solving process. The findings also show that when the problem is sophisticatedly/crudely defined, the junior doctors used material/social resources respectively in the problem-solving process to achieve their objectives. However, there is an exception when the use of social resources is given priority, i.e., when the problem is classed as ‘high risk’ for the patient or if the junior doctor has low self-confidence in her corrective actions. So, in a high-risk situation, social resources were selected to maintain the safety and quality of patient care. Furthermore, in a situation where junior doctors have low self-confidence in what they are doing after using material resources, they thoughtfully select social resources to overcome the problem of low self-confidence and plan to ask for a second opinion from an expert, as is guided in the junior doctors’ NHS policies. This is shown in Figure 5.2.

One important aspect needs to consider in understanding the varied use of social and material resources in similar situations by different doctors. The junior doctors mobilising their existing knowledge/mindlines in defining the nature of the problem and the selection of social or material resources in a particular situation, it is possible that in the same situation and circumstances, one doctor may use social resources, and another may use material resources to achieve their objectives and to learn.

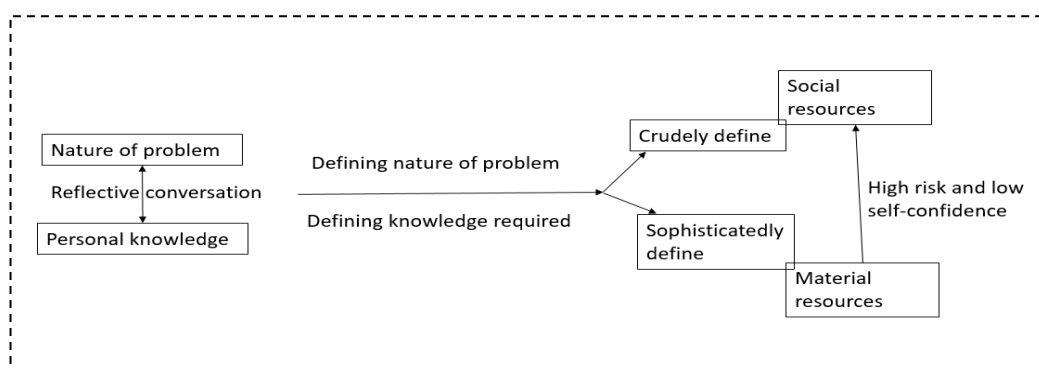


Figure 5-2: When junior doctors use social or material resources in the problem-solving process.

This raises however several questions on implementing the use of social and material resources in the problem-solving. For example, what is the analytical distinction between using social and material resources and on what basis do junior doctors select specific social or material resources to achieve the benefits as mentioned above of the use of social and material resources? These are addressed in the next Chapter 6, which articulates the process of thoughtful use of social and material resources.

6 CHAPTER 6: THE PROCESS OF USING SOCIAL AND MATERIAL RESOURCES IN THE PROBLEM-SOLVING

6.1 Introduction

As discussed in Chapter 5, the selection of the relevant social and/or material resources in a given situation is vital for developing a rich and authentic ‘modified and/or new mindlines’; only then can a junior doctor adjust her actions to handle the problematic situation. From this perspective, how they select a specific person or material resource to use in a given situation to provide them with a modified and/or new mindlines to solve the problem. Hence, in this Chapter, I will address the concerns as mentioned above by responding to the third guiding research question, ‘How do junior doctors work with social and material resources in the midst of their problem-solving process?’

6.2 The process of selecting specific social and material resources in problem-solving

Keeping the junior doctors’ objectives and the hospital working context in mind, I further analysed the data to explore the underlying assumptions of the selection of specific social and material resources by junior doctors in the problem-solving process. In this section, I will discuss how junior doctors select specific social resources or specific material resources in a given situation in the problem-solving in the midst of the action.

As I will show in this section, there are three fundamental aspects of the situation and resources that define its selection in a particular problem-solving the situation. These are: 1) making sense of the problem and evaluating the expertise of potential resources; 2) willingness: which person is willing to help in a given time and space; and 3) availability: can that resource be made available? These three aspects are closely entangled in the process of the selection of resources in the junior doctor's practice. For this reason, in my illustrative examples, you will see all three

factors working simultaneously, but I will unfold the complexities of each factor step by step.

6.2.1 Making sense of the problem and evaluating the expertise of potential resources

6.2.1.1 Evaluating the clues that signify the suitable expertise of the person in a given situation

The selection of specific social resources to receive valid and relevant guidance for improvisation is a complex process for junior doctors. The junior doctors' understanding of the complexity and nature of the problem is a pre-requisite (that is gained in the problem recognition process, as mentioned in first part of the findings section) for the selection of social resources in problem-solving. The process starts with matching the expertise of a potential social resource with the knowledge required in a given situation so that the 'modified and/or new mindlines' is rich and authentic enough to be used in problem-solving to achieve desired objectives. The findings of the study show that the matching process involves thinking about the clues that guide junior doctors on the expertise of potential social resources. For example:

D7 takes a blue coloured cannula; when she was attempting to insert the cannula, the needle of the cannula became stuck inside, and it was not coming out. D7 quickly went to fetch a nurse and explained that the cannula needle was stuck inside and was not coming out. The nurse just pulled it out, and it was fine. D7 asked the nurse what she did. The nurse just pulled it out a little hard; sometimes this happens with these cannulas.

(Field notes: Acute Medicine ward -D7 on 05-11-14)

The problem the junior doctor faced was not complex, but she required immediate help, and the problem was resolved by requesting the nurse. When I asked D7 why she specifically selected that nurse, she said:

She is a very experienced nurse, and it is a nurse's speciality to deal with cannulas and stuff. She is very friendly and helpful.
(Acute Medicine ward -D7 on 05-11-14)

The decision to ask a nurse to help was based on the evidence that 'it is a nurse's speciality to deal with cannulas and stuff' and the problem was related to their expertise. The second point, on why she specifically selected that nurse was because D7 estimated her willingness to help in a given situation based on the fact that she is 'friendly'. The word 'friendly' indicates that D7 was aware that this specific nurse would help her. Selection of the most appropriate personnel was made by reflecting on the clues that guided the junior doctor towards the expertise of potential social resources to solve the problem and manage the patient safely and effectively in a problematic situation. It can be seen more prominently in the following the relatively complex example.

D19 was reviewing a 24-year-old female patient. The patient presented in A&E complaining of tiredness and headache. D19 checked the patient's records and found she had been diagnosed with 'post-viral fatigue syndrome'. D19 counselled the patient:

D19: in 'post-viral fatigue syndrome', fatigue and tiredness are obvious symptoms.

Patient: How long will it take and what is the medication for this?

D19: Let me check with my senior colleague.

(Field notes: Accident and Emergency department-D19 on 02-07-15)

D19 left the patient to get advice from the senior doctor. D19's problem is:

She [patient] has 'post-viral fatigue syndrome'. Fatigue and tiredness are obvious symptoms, but how long will the symptoms last because it's already been two weeks.

(Accident and Emergency department-D19 on 02-07-15)

After this, D19 looked for a relevant person to ask for advice in this situation. She looked around and selectively chose the senior registrar. Although other senior fellows were available there and then, D19 went to the senior registrar, mentioned the patient's condition and asked how long the condition can persist. They discussed the patient for only 1-2 minutes, and the *senior registrar referred D19 to consult the 'post-viral fatigue syndrome'¹ leaflet*. D19 came back with the leaflet, prescribed the medication and counselled the patient effectively, leaving the patient happy. When I asked D19 why she went to speak to that particular doctor for advice, D19 said:

'You know GPs frequently manage this problem, and he [the senior doctor] is a GP He works here on a temporary basis. So I thought, he can give me better and accurate guidance in this matter, so that is what has happened'.

(Accident and Emergency department-D19 on 02-07-15)

In this vignette, D19 selected the specific senior registrar by reflecting on the clue that she works as a GP, which indicates the senior registrar's expertise and helps match her with the nature of the problem in hand. In this decision, she thought that senior fellow was a GP and GPs manage such problems so she must be more suitable for the advice. Moreover, she was willing to help as it is her duty. In order to talk about availability, D19 made an effort to look for the selected senior fellow in the department and specifically went to her.

In the examples mentioned above, it seems like the selection of a person is solely dependent on the clues associated with the designations, but this is not the case. It is much more complex and involves reflecting on previous observations of others' expertise as well. For example, in the Acute Medicine ward, D13 was managing a patient, and she was required to do a lumbar puncture (LP- the procedure of taking fluid samples from the backbone of the patient). D13 was not confident in

¹ Here, I recall my previous findings, that is, in a sophisticatedly defined problems junior doctors used and should use material resources, but she used a social resource. The selection of social resources rather than material was pragmatically the wrong decision, although D19 reflectively selected the right person to get the right information. It was increasing the work pressure on colleagues. D19 could have used the leaflet herself that the GP doctor referred to in her advice.

performing the procedure herself but also wanted to learn the procedure. D13 selected a specific senior fellow to achieve excellence in practice.

[.....] the registrar visited the ward [about 2 pm] and asked D13 for the patient who required the 'lumbar puncture (LP)' test (taking a sample from the spinal fluid) [.....] D13 went with the registrar to the bedside of the patient. [.....] Hereafter, the registrar performed the LP, and D13 went back to the doctors' office. [.....] D13 got busy watching some tutorial videos about LP on 'YouTube' [it was now 4 pm]. The nurse came to D13 and told her that there was one more patient who needed an urgent LP as the consultant had just reviewed the patient. D13 said to the nurse that [consultant name] is very good at doing LP; I will do the LP myself and ask [consultant name] her to supervise me.

(Field notes: Acute Medicine ward- D13 on 19-11-14)

Now, D13 has to manage the patient who required an LP. Yet, D13 was not confident enough to perform the LP herself. However, it was quite surprising to me that two hours before, another doctor had been doing the same procedure and D13 had not attempted to learn from her, but now she was planning to request a specific doctor supervise her in performing an LP. Hereafter:

D13 went to the consultant and asked if she could supervise during the LP. The consultant asked the junior doctor some technical questions, before proceeding to let D13 do the LP on the patient. D13 mentioned her previous observations of the procedure and explained that she had watched the tutorial videos on 'YouTube' and felt confident enough to attempt one herself. Moreover, D13 also admired the consultant's expertise of LP and said, 'your technique of doing LP is excellent, as your patients never complain of pain after the procedure'. [.....]

(Field notes: Acute Medicine ward- D13 on 19-11-14)

D13 selected that particular consultant because her technique of performing LP is excellent. The junior doctor clearly reviewed the clues to evaluate the expertise of the target social resource before selecting her to use in a specific situation. The clue, in this case, was that the ‘patients never complain of pain after the procedure’ means that the consultant is very good at performing the LP. The second important finding in this vignette is that D13 also created the availability and willingness of the targeted consultant. She went to the target consultant, requested her supervision and created the availability. As she requested the consultant’s supervision, D13 showed appreciation of the consultant’s skills by telling her that she is excellent at doing LP. This helped to develop the willingness of the consultant. In this way, D13 modified her actions, managed the patient in a timely way and also learnt the procedure. There can be times when the junior doctor is in a situation when her limited knowledge does not suggest any clue to select the appropriate person for the specific problem, even though she speaks to someone to solve the problem. In such situations, there are two possibilities. First, either the selected person guides the junior doctor to a suitable expert to discuss the issue, or the selected person may give suggestions that are pragmatically invalid in the situation. Next, I provide two examples that shed light on the improvisational process in such situations to achieve the objective in practice.

6.2.1.2 One social resource guide to a suitable expert person

In the situation when the junior doctor’s knowledge does not suggest any clue to help select the suitable person to supplement her knowledge in the problem-solving process, or she carelessly selects the person randomly, the findings suggest that in a hospital setting, an inappropriate expert would guide the junior doctor towards a suitable person in a given situation. For example, D16 was managing a patient on the Acute Medicine ward who was referred by her GP for urgent assessment for abdominal aortic aneurysm (AAA). The patient presented with sudden onset of severe abdominal pain and was seen by a vascular surgeon six months ago. The reports from the previous CT scan showed a very small leakage from the repaired site of the AAA. D16 explained:

My initial assessment is satisfactory with no signs of haemodynamic compromise nor signs of a leaking AAA. But due to the history and complexity of the patient's problems, I inserted a grey venflon [...] and called my consultant to discuss the patient. The consultant asked me to contact the vascular team immediately and act accordingly. You see I called the vascular surgeon, and she asked me to check two things. Check the patient's sensitivity around the waist area and check if her [patient's] abdomen is bruised. Check these things and call me immediately. I am coming to review the patient.

(Acute Medicine ward; D16- 27-11-14)

The example shows that D16 did not thoughtfully select to speak to her consultant, as it is NHS policy for Foundation Year 2 doctors to involve the senior as soon as possible in complicated patients. The junior doctor contacted her consultant, but the consultant's expertise was not matching the complication of the situation in hand. Remarkably, the consultant guided her towards the right person to speak to in the given situation, i.e., the vascular team. The vascular surgeon is an expert in managing AAA; availability was gained through phoning the vascular team and the vascular surgeon was willing to help in the given situation, as it is her responsibility in this situation. Hereafter, D16 called the vascular surgeon and managed the patient safely and effectively. It also indicates that the selection of the right person at the right time is knowledge for a doctor to practice safely.

Similarly, during the fieldwork in the emergency department, D4 was managing a patient with a differential diagnosis of ankle fracture and had some confusion in reading an x-ray:

D4 noticed that there was no swelling and deformity on the right ankle as she wrote on the patient notes, "On inspection, no visible swelling nor deformity of the right ankle". So looking at the condition of the child, D21 came back and talked with the nurse about the child looking in pain and gave him Ibuprofen as well. [child had already been given paracetamol]. D21 also showed

concern that the child was uncomfortable with the examination. I am requesting his ankle x-ray. [...]

'The x-ray of the ankle is normal, but I have some confusion about the x-ray because there is an oblique fracture of the tibia near the mid shaft'. D4 went to the consultant to discuss the patient; the consultant looked at the x-ray and asked D4 to discuss the patient with Dr.xxxx (registrar level). Then D4 went to Dr. XXXX, showed him/her the x-ray and together they made a plan to treat the patient for a fracture and bandage the patient. D4 had been exploring the issue of children's ankle fractures, but it was a fracture at the upper part of the leg. Dr. XXXX also advised D4 that in toddlers, one should always carefully examine above and below the targeted fracture. If, due to any symptoms, you are suspicious of fracture then request an x-ray of the full leg.

(Field notes: Accident and Emergency department-D4 on 28-10-14)

In this situation, D4 selected the consultant to go to for advice but the consultant's expertise was not suitable for the situation, and the consultant herself knew that. The consultant referred D4 to a specific registrar to review the x-ray. When I asked why the consultant did not comment on the x-ray, D4 said:

Dr XXXX worked in orthopaedics before joining A&E. She is very good at picking up on x-ray findings, and she likes bones. Consultants trust Dr XXXX judgements.

(Accident and Emergency department-D4 on 28-10-14)

Here the point is that selecting a person to discuss a problem needs to be a thoughtful process, not a random selection of any available senior doctor. Clearly, D4's selection of consultant for advice was not sagacious because she knew that the registrar was skilled with x-rays because she has worked in orthopaedics. The selection of a person is, however, an important decision to make and is based on clues and evidence suggesting the expertise of a social resource. For example, the clue was 'she worked in the orthopaedic department before joining A&E, and she

likes bones'. These clues provided evidence for the expertise of the registrar related to the situation and her willingness to help (she likes bones). It indicates that the selection of social resources during the problem-solving process is based on clues and evidence related to the expertise of the potential colleague or senior fellow.

Moreover, there are events when the junior doctor has considered the nature of the problem and the expertise of a specific person to establish that she is not suitable for the problem in hand. It also strengthens the finding that the selection of a specific person is very important in problem-solving. For example, D22 opened the patient management system to view the x-ray; the x-ray was available, but the radiology department had not yet reported the findings. The nurse wanted to remove the neck brace as the patient wanted to go to the toilet:

D22 asked the nurse not to remove the neck brace. Meanwhile, the staff nurse approaches D22.

Nurse: How is the x-ray of the patient?

D22: The x-ray is a bit dodgy...

(Field notes: Accident and Emergency department-D22 on 10-08-15)

D22 was not confident in her judgement of x-rays; moreover, the risk level of the problem is so high that it can fatally affect the patient. The nurses were pushing D22 to make the decision quickly so that they could take the patient to the toilet, but at that time, when D22 looked for a senior doctor to advise, no one was available. Hereafter D22 started a discussion with colleagues, although she knew that they were all are junior doctors and that no one could help her in this situation:

*D22 to a colleague (showing her the x-ray): What do you think?
Can you see the fracture, or is it normal?*

A colleague (in confused tone): I am not sure, you should discuss with your senior.

Another colleague: You should call a neurosurgeon to discuss the x-ray and see if she can advise something.

D22: Wait for a second. I cannot annoy a neurosurgeon just to discuss an x-ray. Yes, I would call a neurosurgeon if there was a

fracture and I want to discuss the further management of a patient with a spinal fracture.

(Field notes: Accident and Emergency department-D22 on 10-08-15)

In this vignette, D22 has an understanding of the nature of the problem and the expertise of others to involve in such a problem. Furthermore, she is of the opinion that it is not the neurosurgeon's expertise and responsibility to discuss x-rays. In this process of evaluating the expertise of social resources, the junior doctor indicates that the neurosurgeon has neither the expertise nor the willingness to discuss the x-ray. As D22 mentioned 'I cannot annoy'. This suggests it is therefore very important to think about the situation and evaluate the social resources to select an appropriate person to involve in a given situation. It also raises the question: what do junior doctors do in the situation when the selected person suggests some solution but does not fit in the given situation? This is discussed next.

6.2.1.3 Evaluating the suggestions in grounded realities

Moreover, it is not necessarily true that the most 'expert' person is the most suitable for solving the problem at hand. It also depends on what the person is advising and evaluating the assumptions on grounded realities before implementing for problem-solving. In other words, the usefulness and effectiveness of a social resource are highly dependent on the selection of a specific member of the community of practice to collect a reliable and legitimate 'modified and/or new mindlines'. In the following example, the junior doctor was managing a patient complaining of a 1-day history of blisters on the toes on the left foot.

D23 went to the patient and started asking about the nature of the complaint. She observed that the patient looked well with no history of trauma or fever. At the same time, the daughter [of the patient] mentioned that a similar scenario had happened last time when he [patient] had blisters on his right foot and was discharged with dressing and infection spread to the tissues and eventually bones ending in a 2nd toe amputation. [...] On examination, D23 noted that the

'patient's feet are muddy and very poor hygiene with long dirty nails, round sterile-looking blisters on the middle three toes, no pus, no skin breach, no fungal infection in between the toes, normal sensation and pulses and no pain on movement of the toes. The patient's medical history indicates that his diabetes is not well controlled. So I must give him an antibiotic to prevent the future possibility of infection'.

Now the junior doctor had an opinion on dressing the blister but was confused about what type of dressing should be used.

She went to her registrar for advice about which suitable dressing to put on blisters. The registrar advised the de-roofing of the blisters under sterile conditions and then dressing without antibiotics as there is no sign of infection at the moment and then advise a GP follow-up of the wound. The daughter and the patient were clearly not happy with the decision and the patient kept on saying 'Last time the infection spread very quickly, and eventually, I lost my toe'. The registrar gave good reassurance that they would take the swabs and chase it if in case it grows any bug. The junior doctor had to find a senior sister for de-roofing the blisters aseptically and then dressed the toes.

[....] D23 was very keen to give this patient antibiotics because his sugar levels were not controlled; he had poor feet hygiene and previous bad experience. D23 looked for a diabetic nurse to discuss the situation. The diabetic nurse was surprised at the decision not to give antibiotics to a diabetic patient. She advised D23 that they had good evidence to give an antibiotic, e.g., an old man, poor diabetic control, bad foot hygiene, the risk of infection after de-roofing the blisters and most importantly, a concerned patient and daughter with previous bad experience, so they should go for it. [....] D23 prescribed the antibiotics and could see how happy the patient and her daughter were [....].

(Field notes: Accident and Emergency department-D23 on 16-08-15)

In this vignette, the junior doctor overruled the advice of a senior doctor and followed the diabetic nurse to manage the situation. This was because the registrar's suggestion was evaluated in given grounded realities, which seemed inappropriate to the junior doctor. Various factors influenced D23's selection of a person to follow. First, she reviewed the contextual evidence with regards to what they were suggesting, i.e., assessed the complexity of the problem. The junior doctor wanted to give an antibiotic on the basis of contextual clues and evidence that the patient was an 'old man, with poor diabetic control and bad foot hygiene'.

On the other hand, the senior doctor was of the opinion that an antibiotic should not be given as 'there is no sign of infection at the moment'. This made the junior doctor more confused. Hereafter, D23 specifically selected the diabetic nurse; she provided logical reasoning, explaining that 'they have good evidence to give an antibiotic. For example, he was an old man, with poor diabetic control and bad foot hygiene' which supported the grounded reality and D23 managed the problem according to the nurse's advice. Secondly, the point was, how logical does the decision sound in professional practice, and who is saying what? In the above context, D23 explained that:

[name of the diabetic nurse] is very experienced in managing the diabetic patient and she has seen thousands of such patients.... She knows what can go wrong in diabetic patients. Moreover, her suggestion is logical and makes sense.

(Accident and Emergency department-D23 on 16-08-15)

The junior doctor focused on the expertise of the diabetic nurse about the problem in hand and based her selection on the evidence that the diabetic nurse had seen thousands of such patients, so she knows what can go wrong. Hence, in a situation when the selected social resource provides suggestions (solutions) that do not sound appropriate, junior doctors should repeat the process of the selection of social resources in modifying actions to solve the problem and achieve the objective of the practice. That is, again evaluating the expertise, availability, and willingness of the suitable person.

6.2.2 The significant role of the availability and willingness of the social resource

In a problematic situation, the selection of a social resource can be significantly influenced by the availability and willingness of a potential social resource. In the following example from reflective logs, the junior doctor changed her selection of social resource because of the assumption that a specific person may get annoyed at a particular time. This is an indication of evaluating the willingness of a resource. See the following example:

During a night shift, I clerked a patient in who was seen by a GP in [deleted surgery name] with left lower abdominal pain and a soaked wound dressing. She was a week post op[ration] following a very complex and difficult hysterectomy. She was started on Oral opiates and referred to us. She was in considerable pain despite her simple painkillers topped up with Oxynorm [medicine name]. I had to give her IV [intravenous] morphine in A&E. Her inflammatory markers were raised, so I started her on IV [intravenous] amoxicillin, Metronidazole and Gentamicin to treat an intra-abdominal source of sepsis.

The consultant who operated on her wrote in her notes that 'it was the most difficult laparotomy they have done' because of previous proctocolectomy secondary to IBS [irritable bowel syndrome] and adhesions. I gave her IV morphine which 'took the edge away' but she was still sore. ... [management of patient] *It was 4 am, and the consultant who originally operated on her was not on call and was to be informed.* I called the on-call consultant to review the patient as she was deteriorating [.....] It was clear from my discussion with her (who did not operate on patient) that it was not going to be easy to treat her if she was re-operated on, and suggested I needed to call the surgeon who actually operated on the patient. However, I knew that *I was not*

going to be popular among my seniors if they were bothered at 4 am for that complex patient. I tried to ensure that the patient was stable and any reversible causes were ruled out and informed the on-duty senior registrar and it was her call to wake the consultant up. She decided to wait a couple of hours before contacting anyone. (Reflective log 5, emphasis added)

In the above reflective log entry, the junior doctor was completely aware of the complexity of the situation and that it was a must call for the consultant. However, the on-call consultant did not operate on the patient, and it seemed that she was not willing to take responsibility for the patient at this stage. The on-duty consultant suggested that the junior doctor should contact the consultant who operated on the patient. Here the matter of willingness is playing an important role because it is quite possible that the most suitable person in the various situations may not be available or not willing to take responsibility in a particular situation. Moreover, the junior doctors should think about how to create the willingness of the targeted person to help in a given time and space in the problem-solving process.

6.2.2.1 Creating the willingness

In the previous examples, I continuously linked all three aspects of the selection of social resources in the problem-solving process. With regard to willingness, the findings show that junior doctors create willingness of potential social resources by requesting and appreciating other people's help in the situation (e.g., examples of learning how to do an LP advice from the GP) or making the other person realize that it is her responsibility (e.g., examples of x-ray review, vascular surgeon). The following example takes this further and shows that junior doctors dedicatedly make an effort to create willingness in others to help in problem-solving. In the emergency department, D20 was managing a 13-year-old autistic child who came in with abdomen pain. D20 went to see the patient, who was accompanied by his mother. D20 took the patient and his mother into the examination room; the child appeared to be aggressive and restless. The mother explained that the [child] had been having severe pain in his tummy since the day before, was constipated, and had also vomited that morning. D20 tried to engage the child to ask about the pain, but

he was severely autistic and did not communicate with D20, nor did he allow D20 to examine him properly. The child was walking around the room.

D20: Does he behave like this normally?

Mother: No, he [child] is not himself, but when he is in pain, he does behave like this, and that's why I am worried.

(Field notes: Accident and Emergency department-D20 on 05-08-15)

D20 again asked the mother to hold the child so she [D20] could just examine his tummy. D20 just touched the patient's tummy for a few seconds and felt that his tummy was tender and very hard. Furthermore, the mother mentioned that he [child] also has a problem where he swallows things, and perhaps this was the case here. After the examination, D20 told me that:

"On examination, my feelings are that the patient is having pain in the tummy and more likely on the right side. Moreover, I have a feeling that this child is unwell clinically... he needs much more attention."

(Accident and Emergency department-D20 on 05-08-15)

D20 went to the senior doctor and described the tender abdomen, pain on the right side and a tendency for the patient to swallow things. D20 mentioned her concern to the senior doctor:

D20: I am basically worried if he [patient] has swallowed something hard. We can manage a urine dip that shows ketones.

Senior doctor: If the patient has not given the current history of swallowing something then don't complicate the problem.

(Accident and Emergency department-D20 on 05-08-15)

D20 was not convinced of the senior doctor's suggestion to disregard the idea that the child may have swallowed something if the mother is not sure. As D20 told me:

“The big problem is I have no investigations. He [patient] did not allow me to take blood, not even temperature. I cannot understand what to do. I was only thinking that maybe he has swallowed something that is damaging his organs but could not say anything. I should talk to the surgery team because the child has acute abdominal pain.”

(Accident and Emergency department-D20 on 05-08-15)

Now, here again, my previous conclusion is supported. The suggestions of one specific person should be evaluated in grounded realities and if they are not logically supported in the grounded realities, overrule them and look for another suitable person. That is what D20 did. D20 now decided to speak to the surgery team as the patient has acute abdominal pain, therefore matching expertise. D20 called the surgery department and told me that:

An autistic child is very difficult to examine, but I think it's appendicitis; I am not very sure, but it could be. I am not sure why I am saying it's appendicitis. I don't have any bloods, I was not able to properly examine, so how can the surgeon receive the patient as an appendicitis patient? That is why she (the surgeon) advised me to get help from the peads [Paediatrics] department. Usually, such patients are managed by sedating them for the execution of an investigation. After an investigation, I can take this patient.

(Accident and Emergency department-D20 on 05-08-15)

This is how D20 created the willingness the relevant person, i.e., the surgeon to talk with about the patient. This selection was based on the clues suggesting the expertise of another healthcare professional. The surgeon advised talking to the paediatrics department to see if they can do the investigations. It is again acknowledgement of my previous findings that one social resource guides the doctor to another suitable social resource, i.e., to the Paediatrics department to manage the problem. On the other hand, D20 was now taking action to create willingness in the

surgeon so that he would agree to take over the patient, and could then be safely managed.

At this stage, the problem was related to the ‘willingness’ of the other healthcare professionals to get involved in the patient’s management. In order to create willingness in the surgeon, D20 called the Paediatrics department, again told the whole story and then paused:

D20 to Peads [paediatrics] registrar: It’s the acute abdomen, what can we do, it should be going to the surgery department. I have already spoken to the surgeon, and the surgeon asked if you can manage to do his [patient] investigations.

Peads [paediatrics] registrar: That’s all right, we can admit the child for investigation, but the surgeon has to be lead for the patient; tell them that.

D20: Ok, thank you. I will speak to the surgeon again.

(Field notes: Accident and Emergency department-D20 on 05-08-15)

Here the willingness of the paediatrics department was created by requesting and appreciating their help in patient management. Following this, D20 again called the surgeon, said that she had spoken to the peads [paediatrics] department and explained that they would admit the patient for help only, but the surgeons have to lead on this patient. The message was that the surgeon had to examine and treat the patient, as the patient had an acute abdomen:

Surgeon [as told by D20]: What would we do with the patient?

D20: What do you mean, what will you do? I just spoke to you, and you were saying that ok, we will take the patient after the investigations with the help of peads [paediatrics] department. Now they are ready for the help; I don’t understand why you are reluctant to take the patient.

Surgeon [as told by D20]: How can you say it is appendicitis?

D20: Because I have seen the child, he is latterly gripping his tummy, and he is wandering here and there in agony and his mother

told that he is not like that in normal circumstances. He also had one episode of vomiting.... That's the reason I am saying it's acute abdomen. Now, are you accepting it or not? I am going to document everything in the patient notes.

*Surgeon [as told by D20]: We don't have much choice, do we?
[laughing and telling me]*

D20: It could be just constipation but it could be the worst as well; my feeling is, he is not fine. I don't want to compromise patient care.

(Field notes: Accident and Emergency department-D20 on 05-08-15)

In this way, the patient was managed by involving the surgery department and the paediatrics department. The junior doctor created the willingness of surgeons by making them realise that it is their responsibility and if they are not willing, the doctor will document everything. Hereafter, the patient was first transferred to the paediatrics department where his investigations were done and then transferred to the surgery department. After three days, D20 told me that the child had swallowed some big magnets which had shown on the x-ray and then surgeons operated on him.

Thus, it is important when handling problems in a hospital setting that junior doctors think of creating the willingness of other social resources for the safety and effectiveness of patient management and their practice. Hence, the selection of social resources in problem-solving process is based on the practice of matching the nature of the problem and the expertise of the most appropriate person to involve in solving the problem and then creating the availability and willingness of resources. It is sometimes appropriate to take further advice and assumptions to move forward and achieve the objectives. Sometimes the selection is not appropriate, as was the case in the above example when D20 also spoke to her senior registrar who advised her to ignore the possibility of a child's swallowing problem. When D20 evaluated her suggestions based on what she was observing of the specific scene of action, she was able to decide to speak to the surgeon. These selections are usually based on evidence and clues about the expertise of other healthcare professionals; as such, the selection of the surgeon was based on her experience that surgeons manage acute abdomen.

6.2.3 The selection of a specific material resource

The junior doctor realised the problem in practice and evaluated the nature of the problem. Her personal knowledge and experience were not able to guide her practice. In that instant, the junior doctor was able to define the problem clearly and decided to consult some online resources, books or protocol guide (material resources) to resolve the problem in practice. As I mentioned in section 6.2, junior doctors' aims and objectives are twofold; one to perform better and learn from experience and two, to complete the training by developing a reputation with senior fellows that they are learning to work independently. In this regard, the selection of material resources is comparatively easy, as the search for material resources itself is guided by the sophisticatedly defined nature of the problem.

For example, when D24 was examining a patient [who is a welder by profession] with a complaint of pain in the eye, she found a damaged lens, which she could not recognise at that time. D24 was aware of some specific eye condition related to the welding profession, and this provided some clarity in defining the problem. D24 first Googled the term 'welder's eye' and looked at different images to find a similar condition. Then D24 clicked on the image, and she learned that the condition is called 'corneal flash burn'. The sophistication of language was enhanced, and this information guides any further search. Hereafter, D24 opened the NICE guidelines and searched for 'corneal flash burn', where she found further management of the condition. D24 then went to the senior fellow and proposed the management plan; the senior fellow came to see the patient along with D24 and confirmed that "yes, it is 'corneal flash burn', do as you have planned". Clearly, D24 used online resources in managing the patient and learned from it.

The selection of various resources cannot be said to be random. It was thoughtful and organised use of online resources. The selection was mainly guided by D24's knowledge on the availability of material resources and the nature of knowledge required to solve the problem in hand. Thus, the findings suggest that for the junior doctor to learn and become an independent doctor, she has to think consciously and decide whether the existing problem can be sorted by using different available material resources (online databases, books, guidelines etc.).

6.2.4 Summary

The findings suggest that the junior doctors' selection of a specific person among available social resources is a complex process. It is influenced by three contextual factors, namely: 1) bearing in mind the expertise of a person; 2) her availability to provide advice as needed, and 3) her willingness to offer advice. First, the junior doctor thinks about who has the minimum expertise needed to solve the problem in hand. The minimum expertise indicates that junior doctors do not discuss every problem with the consultant. The level of complexity of the problem defines the level of expertise of the social resource. The findings also show that in an NHS hospital setting the selection of a social resource is facilitated by specialised fields of expertise in a hospital setting. Among the specialised groups of people, there are various observable clues and evidence that guide junior doctors too who will be the most suitable and willing co-workers to help in a specific situation. These clues are assessed by junior doctors during the selection process to be sure that the selection is accurate.

Moreover, findings illustrate that if the selected person is not suitable, that person further guides the junior doctor towards a suitable expert in a given situation. On the other hand, if a selected person provides a suggestion of the problem and is evaluated in relation to observed specificities of the situation at hand before acting upon it. If the suggestion is refuted, the junior doctor again looks for an appropriate person for further information and to build a 'modified and/or new mindlines' to solve the problem. Thus, the selection of social resources is a complex process to create rich and legitimate 'modified and/or new mindlines' for thoughtful, responsive actions in the problem-solving process. Furthermore, junior doctors use material resources on occasions where the problem is sophisticatedly defined in the professional language, the definition of the problem itself act as a guide for the use of material resources in problem-solving.

6.3 Reviewing the outcomes and evaluating the effectiveness of the accepted new mindlines and resource used

The finally to sum up the whole learning experience and review is required on how different resources helped a junior doctor in managing a complicated situation. The findings of the study help junior doctors to appreciate the complexity of their experience and learn from their experience. To reflect on the practice, junior doctors can focus on the epistemology of problem recognition and problem-solving process and how various resources facilitated their learning trajectory.

It is an important part of junior doctors' learning to make sense of the whole process of using various resources and bridging the knowledge gap in the problem-solving process. For example, to make use of explicit resources, search the database, work with the patient management system and/or look into medical books, understanding how these resources were accessed and what important contribution they provided in the problem-solving. Similarly, discussing, talking and getting guidance from others helps junior doctors to uncover previously overlooked clues of practice. At this point, problem-solving encourages junior doctors to consider how they were able to select others for discussions and the significant turning points that change the direction of junior doctors' actions. The junior doctors decide to get trustworthy guidance from material resources (books, protocol guidelines, online sources, etc.) or social resources (discussions, talks, observations, feedback from other healthcare professionals). During the problem-solving process at this stage, significant attention is required to focus on the clues and evidence that have been used in judging and selecting the resources. The ability to recognise these cues and indications is the signpost for junior doctors to select the best possible information, skills and behaviour from the available situated knowledge. The use of different resources or the combination of resources in various situations creates a 'modified and/or new mindlines' that bridges the knowledge gap and solve the problem. Thus, junior doctors learn who is who, who is good at what, what is whose responsibility and what are the different professionals' interests, on which they feel confident and happy to talk about and guide on. All the knowledge and learning became embodied in the junior doctor and in the context of practice.

The use of every resource should be evaluated against the outcomes achieved through each resource. In such a process, junior doctors develop a tacit understanding of the usefulness of social and material resources in different problematic situations. Moreover, they may be able to articulate which resource helps in which kind of problem and how they can endeavour to improve their selection of resources for better performance in practice.

In conclusion, junior doctors' process of problem-solving comprises of five steps, namely; 1) problem recognition; 2) recognising the need to get help from contextual social and material resources due to a knowledge gap; 3) taking the decision to use social or material resources; 4) the thoughtful selection of the most suitable resource in a particular situation and grasping the required knowledge from it; and 5) reviewing the outcomes and understanding the problem-solving process of managing a problem in a given situation. Each step itself encompasses a complex process, as explained and shown in this Chapter. The whole process is shown in the following in Figure 6.1:

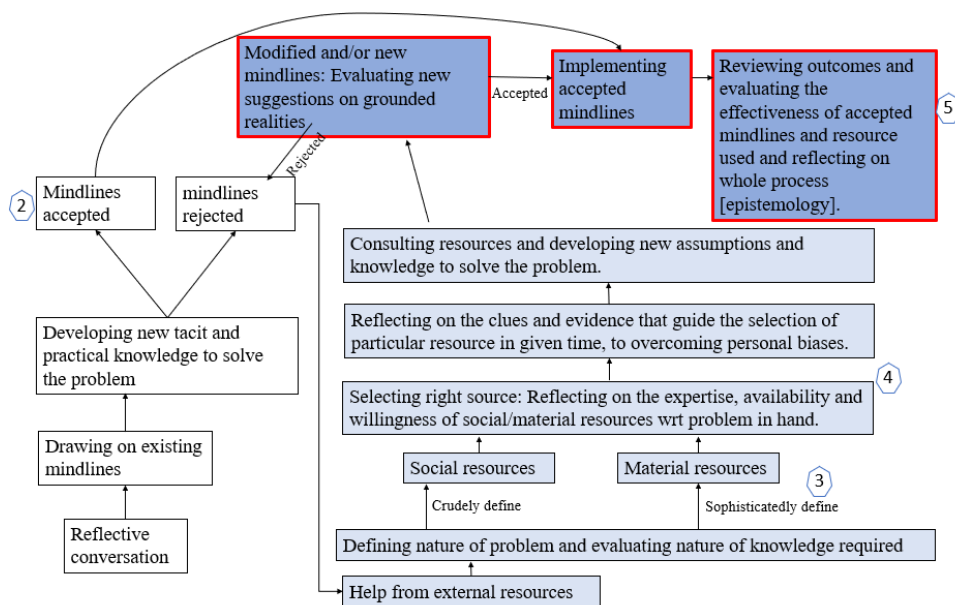


Figure 6-1: The process of the use of social and material resources in problem-solving.

7 CHAPTER 7: DISCUSSION

I began my study by accentuating the importance of doctors being able to use problem-solving in everyday work to provide safe and effective healthcare in the UK NHS. The study concurs that developing mindfulness during the practice and the ability to process information in problem recognition and the use of social and material resources to develop problem-solving capabilities in junior doctors, is essential for the problem-solving process. The necessity for developing problem-solving skills is often implied in literature but is rarely explicated and examined empirically in terms of how it manifests in junior doctors' real work settings. Drawing from four streams of literature on namely: mindfulness (Epstein, 1999; Weick, 1995), information processing and decision-making (O'Neill et al., 2005; Norman et al., 2009), sense-making (Sandburg and Tsoukas, 2015; Weick and Sutcliffe, 2006), and knowledge sharing (Gabbay and Le May, 2004; Lave and Wenger, 1991). Three main research questions guided the study:

- 1) How is mindfulness and information processing manifested in the situated processes of junior doctors' problem recognition during their everyday work?
- 2) How do junior doctors decide when and why to use social and material resources in the midst of their problem-solving process?
- 3) How do junior doctors work with social and material resources in the midst of their problem-solving process?

To explore the research questions mentioned above, the study contributes to our theoretical and empirical understanding of activities and processes that develop capabilities of problem recognition and problem-solving in junior doctors, as a key recognised feature of what makes an expert practitioner and the process of becoming one. In this Chapter, I will illustrate and discuss the empirical and theoretical contributions of the study concerning the research questions mentioned above, taking each one in turn.

7.1 Defining the problem in practice.

In this study, a number of labels serve to characterise ‘problem definition’, such as undetermined situation, being surprised, having uncomfortable feelings, critical point, ‘struck in action’ and ‘issue in action’ (Cunliffe, 2002; Barnett, 1997; Atkins and Murphy, 1993; Jordan, 2010; Schön, 1983; Dewey, 1933). As further elaborated in the literature review Chapter 2, the literature on problem-solving (Tanner et al., 1987; O’Neill et al., 2005; Norman et al., 2009; Hall, 2002; Dewey, 1933) considers problem recognition in professionals’ practice as a spontaneous process, but the professional is also required to maintain the mindfulness in the activity and interpret the information to articulate the problem (Yanow and Tsoukas, 2009). Drawing on mindfulness, we are aware that problem recognition and solving required attention to details of the contexts, specific knowledge and actions in capturing clues and information (Klein, 2017). Similarly, the information interpretation (analytical and intuitive reasoning) is, to articulate a situation as problematic, or influenced by contextual factors (Durning et al. 2011; McBee et al., 2015; Norman et al., 2009).

However, the literature does not explain how professionals maintain and manifest mindfulness, as a process of continuous accomplishment amid practice through specific activities and processes during problem recognition. This theoretical gap restricts our understanding of how junior professionals may learn to recognise problems in everyday work in the first place, to solve the problem in their actions (Sandars and Patel, 2015; Jordan, 2010; Yanow and Tsoukas, 2009) or error causing factors (Graber, 2005). The study aimed to address this gap. The study’s contributions are twofold. First, the study shows how junior doctors recognise problems (error-causing factors) by paying attention to bodily actions and the importance of the process of information acquisition and interpretation which occurs in distinct ways; i.e., via the application of related knowledge and existing ‘mindlines’ (Gabbay and Le May, 2004; Gabbay and Le May, 2011). Second, the use of tools and technology to capture and interpret situated clues, and most importantly, the interrelation of these activities to enable junior doctors to recognise the problem in their actions.

There are however important similarities between these findings and other studies on mindfulness and information acquisition, as is explained in the following Table 7.1. Table 7.1 defining the analytical constructs of the study with regard to problem recognition with the support of empirical evidence and linking them to the relevant literature.

Table 7-1: The practice of junior doctor in problem definition amid an activity.

The practice of junior doctor in problem definition amid an activity		
Findings	Empirical evidence	Links to extent theories
Personal engagement: Body and mind involved in the activity to capture kinaesthetic and tactile details, smell, gestures, emotions and feelings, and information from a given context.	<p>“My first observation which clicks me was the yellowish eyelashes”.</p> <p>“I observed a strong urine smell coming from the patient.”</p> <p>“I examine the patient and have different feelings from her facials... Like the patient is in agony and pain.”</p> <p>“I saw disgust in the eyes of an innocent 3-year-old child when she looked at my hands. That is why I came out of the patient room and washed my hands”.</p>	<p>‘backtalk’ (Schön, 1983)</p> <p>‘moment-to-moment’ attention (Epstein, 1995)</p> <p>Being there in the present, with both body and mind (Weick and Putnam, 2006)</p> <p>Information acquisition (Norman et al., 2009; O’Neill et al., 2005)</p>
A systematic approach to activity: Professional knowledge to undertake an activity to collect rich information.	<p>“In the ABCDE guide, it’s not just to check the Airway, Breathing, Circulation, Disability and Exposure of the patient. This guide also tells us how, what to see and what to do?”</p> <p>“Most of the questions that I ask the patient are based on guidelines though sometimes we need to ask various other questions to understand the patient’s problem.”</p>	<p>logical steps of an activity (Rogers 2003; Banning, 2008),</p> <p>Mindlines (Gabbay and Le May, 2004)</p> <p>‘capacity for action’ (Weick and Sutcliffe, 2006)</p>
The attention to the big picture: Collection of broader information by using all possible tools and technology and	[In the patient management system] I found that the patient had a long history of psychiatric/mental health, mild cervical spine stenosis and subclavian vein compression by a cervical rib. She has been under [name of another	<p>Information acquisition (Dewey, 1933; Epstein, 1999; Norman et al., 2009)</p> <p>Situational awareness</p>

people to be informed about the context.	hospital] follow-up for the last two years, and the patient was also ‘red flagged’. Now it is making sense that there is a possibility of a brain tumour.	(Randel, Pugh and Reed, 1996) ‘rich awareness of discriminatory detail’ (Weick and Sutcliffe, 2006)
Meaningful comparisons: Negotiating the meaning of clues and information. Comparing personal thoughts and judgements with theories, evidence and experts’ practice to evaluate given importance to specific information.	“Urine smell is an indicator of either a displaced catheter and urine may be leaking somewhere, or the patient is suffering from a UTI.” Toddler fracture: the x-ray shows no fracture, but the child was in pain. X-ray was overruled by the doctor’s observation that the child is in pain and decided to treat the patient as ‘toddler fracture’. “Autistic child with swallowed magnetics: importance was given to the possibility of swallowing something.”	Pattern recognition (Hall, 2002) Interrelating all-round information from diverse sources (Dewey, 1933; Norman et al., 2009). Mindlines (Gabbay and Le May, 2004) Reduce the most alarming risk (Thompson et al., 2002).
	“I have seen my consultant; she always documents what she suggested and why she is suggesting something. That’s why I am doing this as it is good practice.” “One day I started looking at the notes written by the consultants and recorded all the important aspects needed in the notes.”	Relating to previously useful knowledge, ‘mindlines’ (Gabbay and Le May, 2004; O’Neill et al., 2005) Attention to socially known explicit and tacit knowledge of action, processes, rules and policies (Gabbay and Le May, 2004; Epstein, 1999).

For example, the findings of the study in terms of the problem-recognition process, suggest that four activities, namely; personal engagement, application of the systematic approach to activities, attention to the big picture and meaningful comparison are central in the manifestation of mindfulness and processing information in problem recognition. Firstly, the findings show the central role of personal engagement in problem recognition, which refers to bodily and minds involvement in an activity capturing kinaesthetic and tactile details, smell, gestures, emotions and feelings, and information from a given context. It is associated with Weick and Putnam's (2006) suggestion of being there in the present with body and mind and with moment-to-moment attention (Epstein, 1995) to capture clues and information (Schön, 1983; Klein, 2017; Randel et al., 1996). Second, the study concludes on an important role of the systematic approach to activity in maintaining attention to the related details and refers to the contemporary professional knowledge required to undertake an activity. A systematic approach to an activity is associated with the idea that mindfulness is influenced by knowledge of the practitioners and mindlines (Wieck and Putnam, 2006; Epstein, 1995; Gabbay and Le May, 2011). Thirdly, attention to the big picture denotes the use of tools and technology to get access to related information and activity, and this is discussed in the literature on information acquisition (Klein, 1998; Dewey, 1933; Epstein, 1999; Norman et al., 2009). Finally, junior doctors are also involved in a meaningful comparison of their actions, thoughts and judgements with the knowledge that is a blended form of theories, evidence and experts' practice; as expressed in the concept of the mindlines for instance (Gabbay and Le May, 2004; Gabbay and Le May, 2011). Taken together these enable them to evaluate the course of action against the standards of acceptable practice in a given situation as well as defining the problem in their actions those may cause errors or confusion.

However, these practices and activities are discussed in various literature such as decisionmaking, information processing, problem-solving as mentioned above but the contribution of the study lies in elucidating how junior doctors maintain the mindfulness of all these activities and process information, and how each activity helps in accomplishing the others in the flux of everyday activity. The novel contribution of this study is to empirically explain how bodily actions, knowledge,

tools and technology are connected in the manifestation of mindfulness and information processing in everyday work allowing junior doctors to recognise the problem in action. That subsequently explicates that there are at least four distinct understandings of problems in a professional situation, namely: 1) something emerges as a surprise; 2) in the sense that the practitioner feels incapable of undertaking the action; i.e., theoretical and/or practice knowledge gap; 3) in the sense that the practitioner feels there are insufficient clues and evidence in a given situation on which to base an effective comprehension of the situation, and 4) in the sense that there may be deviation from standards of excellence in action. These findings broadly corroborate with Graber's (2005) empirical investigation that suggests that most errors in problem-solving during diagnostic decision-making are due to 1) faulty knowledge, 2) faulty information, 3) faulty interpretation, and 4) faulty verification. The contributions of the study are vested in showing the interdependencies of these four activities and how junior doctors move from one activity to another to maintain mindfulness and information processing in recognising the problem or error-causing factors. This is discussed in the subsequent section.

7.1.1 The manifestation of mindfulness and information processing in problem recognition

Junior doctors need to personally engage with the context of practice by focusing on the 'here and now' and giving full attention to appreciate the present moment (Herndon, 2008, p. 32; Weick et al., 1999; Thondup, 1996). The study shows that junior doctors are motivated to perform the activity to appreciate the bodily ways of doing, learning tacit knowledge and are present in the situation without any duality of body-mind (Dewey, 1933). The personal engagement offers "receptive attention to, and awareness of present events and experience" (Brown et al., 2007, p. 212). The personal engagement provides an engaged body and mind as an instrument to achieve "rich awareness of discriminatory detail" (Weick et al., 1999, p. 88). The findings demonstrate that we are aware of our world through bodily actions (Schatzki 1996) and through a kinaesthetic and tactile ability to capture the backtalk that emerges in this encounter. The personal engagement

enables junior doctors to capture backtalk (Schön, 1983). For example, the junior doctor came to check the patient, and the intense smell of urine from the patient surprised her. She moved to check the catheter and also tested for a urinary tract infection (UTI). She found that the patient was suffering from a UTI and prescribed antibiotics. The study shows a very basic level of mindfulness that everybody can manifest (Kabat-Zinn, 2003). For example, the junior doctor recognises a specific emerging problem through the kinaesthetic and tactile clues (e.g., the smell of urine indicative of urinary tract infection, the patient looks very tired, which is indicative of low blood sugar, etc.) which then leads them to question the situation in more detail. These interpretations are usually based on intuitive reasoning (O'Neill et al., 2005; Norman et al., 2009) and emerge instantly. Such problems are emergent, through the accidental or conscious deliberation of a junior doctor's kinaesthetic and tactile abilities during the activity. In these situations, the (Schön, 1983) junior doctors are surprised when a new problem emerges.

The everyday work in an organisational setting is a complex and messy phenomenon (Nicolini, 2013) that makes it ever challenging for the practitioners to make distinctions about what to record and what to ignore in practice. Thereby, it raises considerations such as 'how to assure that all the important details are captured' in a certain situation to ensure the production of relevant and authentic information to aid in the understanding of the problem encountered. Graber (2005) establishes that many errors are due to faulty data or a lack of data, which resembles the lack of situational awareness. In this regard, the study illustrates that initial kinaesthetic and tactile clues guide junior doctors towards recalling related knowledge and to organising actions in search of related nuance clues and information. The related professional knowledge is represented as 'a systematic approach to activity' in the findings section. The systematic approaches are explicit and tacit public knowledge; i.e., socially and theoretically accepted ways of carrying out activities in a professional context. The systematic approach to activity can be exemplified in doctors' practice as a specific way of taking the history of a patient's symptoms. For example, specific questions for the patient complaining of abdominal pain, and different questions for the patient complaining of chest pain, a specific way to perform a physical examination (e.g., for the examination of a patient in a critical

condition, follow the ABCDE technique), and a specific order of recording information in the patient's notes, etc.

The junior doctor simultaneously captures situated clues, and recalls and modifies actionable knowledge and thinking patterns; this all takes place in the midst of interaction with the patient and results from personal engagement and links to a systematic approach to the activity. In this process, being mindful (Epstein, 1999) of implementing systematic approaches to activities in acquiring information during the encounter with the patient, is essentially an evolving process of modifying actions in relation to situated clues. For example, at the initial encounter with the patient, the patient describes his/her problem while the doctor listens and captures kinaesthetic and tactile clues; i.e., backtalk (such as kinaesthetic and tactile details, smell, gestures, emotions and feelings). The verbally-described problem coupled with backtalk helps a doctor in recalling related professional knowledge (e.g., a child falls from his dad and may have fractured his leg). Further interaction with clues again modifies active knowledge and manages the situation (e.g., the child was not weight bearing, and the x-ray did not show a fracture, so the junior doctor considered "toddler fracture", where the patient is managed as a fracture even though it did not appear on the x-ray).

So, the systematic approach to an activity when separated from context can be considered as rigid evidence-based knowledge, but in practice, its implications are very much similar to Gabbay and Le May (2004) 'mindlines'. The 'mindlines' are the internalised tacit knowledge of a doctor; i.e., guidelines-in-the-head, that they use in everyday decision-making and problem-solving processes and can be refreshed from quick reading as (Gabbay and Le May 2004). Thus, the initially-captured backtalk enables the junior doctor to recall 'mindlines', and subsequently, mindlines facilitate junior doctors in establishing mindfulness in the context of maintaining attention to detail (Weick, 1995) in the problem-recognition process. The study contributes by illustrating that by maintaining mindfulness to detail (Weick, 1995; Weick and Sutcliffe, 2006) in the messiness of organisational settings, the junior doctors can use initial clues and information from the situation as a hint towards applicable knowledge, mindlines, and can return to capture further related information. The systematic approach to an activity directs junior doctors to what

should be counted and what should be ignored during the problem-recognition process. Mindfulness, the applicable knowledge, enables junior doctors to realise the theoretical and conceptual knowledge gap or misfit of existing mindlines that is acting as a problem in a given situation.

Furthermore, the study reveals that surprise or a problem in action may arise from mindfulness of a 'capacity of action' (Weick et al., 1999, p. 88), which is from a junior doctor's incapacity to perform bodily actions to undertake the action. The study shows that surprise can be associated with the capacity of action such as when the junior doctor examined the patient and was unable to recognise the nature of a 'cyst' or remained unable to perform a required medical procedure, such as a 'lumber puncture'. For this purpose, junior doctors have to maintain mindfulness of aesthetic and tactile sense and professional knowledge that guides them to what is required to accomplish a task. Therefore, the problem that may arise in a given situation can be associated with the capacity of action. These findings extend our understanding of the nature of 'surprise' (Schön, 1983) in junior doctors' practice. Accordingly, in the case of the junior professional, and contrary to Schön's (1983) view that surprises only come from backtalk or situated clues, this study shows that in the context of junior doctors, surprise can be associated with the capacity of action. In the back-and-forth movement from personal engagement and active knowledge, the doctors maintain the mindfulness in context and realise that the lack of theoretical and practical knowledge linked to a systematic approach and bodily actions in a given situation, indicates a problem or knowledge gap, concisely, a limitation of artistry (Schön, 1983).

The back-and-forth attention to bodily actions and knowledge facilitates junior doctors in capturing related backtalk and situated clues and verbal information. The interpretation of verbal information is further refined in the light of backtalk/situated clues. The backtalk generates feelings and emotions (e.g., urinary incontinence and back pain lead a junior doctor to see that the cause of back pain is linked to the current urinary incontinence), which led the doctor to explore the situation further and to use tools and technology to enrich the available information. This activity is represented as attention to the big picture in the scope of this study. Paying attention to the big picture means exploring the unseen or obscure information that is related

to the current activity, but that is not recordable through immediate aesthetic and tactile clues (i.e., backtalk) within the context of the clinical interaction. The attention to the big picture requires several thoughtful actions and the use of social and material resources. In the context of this research, *material resources* denotes 'guidelines', books, protocols, policy information, patient management system, switchboard, patient notes, etc. in paper or electronic form, and *social resources* refers to all the members of the NHS healthcare community who are involved with patient care (Nicolini, 2013; Wenger, 1998). To illustrate, the patient presented with abdominal pain; from examination clues and verbal information, there was no obvious direction with which to proceed forward. However, then the patient indicated previous surgical intervention on his gallbladder. There were no indicative clues from physical clues and verbal information; the junior doctor felt that something was missing and the information regarding previous surgery may be able to help. So, the junior doctor used tools and technology to access the information related to the previous surgery. The junior doctor found that after the surgery, the patient had suffered from complications, the gallbladder had leaked and was re-operated. This information guided the junior doctor to consider exploring gallbladder leakage, and that appeared to be the right decision in the management of the patient.

These findings suggest that junior doctors can maintain mindfulness of the big picture due to feelings that emerged from tacit clues and verbal information captured effectively through the engaged body and active knowledge base. The attention to the big picture enhances the junior doctor's ability to enrich the awareness of external factors or to enhance situational awareness (Klein et al., 1993; Norman, 2009; Brown and Ryan, 2003) for effective decision-making regarding the potential problem in action. Further, the study demonstrates that interpretation of information is highly dependent on the richness of the collected information and clues (Norman et al. 2009; Harvey, 2000; Benner and Tanner, 1987; Casebeer et al., 2002) and junior doctors require a mindful attitude towards the use of tools and technology in information acquisition, which influences their information-seeking behaviour (Casebeer et al., 2002) during problem recognition. So, mindfulness of the big picture is guided by the tacit clues and verbal information collected that lead junior doctors to realise emerging problems in the sense that they feel there are insufficient

clues and evidence in a given situation on which to base an effective interpretation/comprehension of the situation. These findings suggest a strategy to minimise errors resulting from a lack of information (Graber, 2005).

Those mentioned above intertwined three activities, namely: personal engagement, systematic approach to activity and attention to the big picture highlight the actions and behaviours of junior doctors in maintaining mindfulness and collecting and enriching situated clues and information. At the same time, junior doctors need evaluative mechanisms to remain critical of these activities, which allows them to recognise the problem, in the sense that there may be a deviation from standards of excellence in action. The study shows that junior doctors are continuously involved in a *meaningful comparison* of self-action with experts' actions, behaviours and norms as a way of following policies and theories in their actions. Meaningful comparison acts as an evaluative mechanism and enables the problem-recognition process.

The meaningful comparison is an activity that recalls what theories suggest on how experts think and act in a similar situation that has been previously observed or learnt through education, training and experience. In this process, doctors use their existing useful knowledge of theories (e.g., theoretical knowledge of managing COPD, investigations required for managing chest pain, protocols, etc.) and the experience of contextual norms and events (ethical consideration, patient confidentiality, good practice, procedures, etc.) by way of retrospective thinking allowing them to make a judgement about a problematic situation. In other words, attention given to socially-known explicit and tacit knowledge of actions, processes, rules and policies (O'Neill et al., 2005; Epstein, 1999) that is embodied in a junior doctor's behaviour helps in problem recognition.

For example, a junior doctor explains "*I observe consultants examining, clerking and managing patients, which helps me to standardise my patient management skills*"; i.e., junior doctors are continuously involved in an evaluative mechanism of their actions by meaningful comparison. The junior doctors can develop the socially-known knowledge (Wegner, 1998) that is a collective possession of work context and they are put into action by experts who maintain

their skilful practice (Lave and Wenger, 1998). The study demonstrates that junior doctors utilise this kind of knowledge base in a '*meaningful comparison*' of self-action with experts' actions and behaviours, as well as norms of professional conduct as a way of following policies and theories in their actions and act as an evaluative mechanism that leads them to recognise deviation from standards of excellence. This is a process of critically evaluating the existing mindlines (Gabbay and Le May, 2004), and exploring if they are fully appropriate in managing the current situation. If not, doctors realise the need to reshape the mindlines during the problem-solving process. In the mindful practice, junior doctors are effectively processing information at the same time, and this is discussed in the following sections.

The process of information acquisition and interpretation works simultaneously. Although it is in line with the dual process theory of information processing that suggests intuitive and analytical reasoning go side by side (Norman et al., 2009; Croskerry, 2009a), this study also illustrates that intuitive interpretations are based on some clues and backtalk and bodily actions influence a junior doctor's reasoning. My study shows that body, knowledge and contextual tools and technology provide a rich set of backtalk, verbal information and evidence that enhances situational awareness. These concurrently act as a rich set of related information. The study illustrates that the intuitive interpretation if doctors take a moment to think about the situated backtalk which provides ground for intuitive understanding, helps in overcoming personal biases (Hall, 2002) during interpretations.

For example, a junior doctor's interpretation that a patient looks very sick is derived from the understanding of the backtalk and clues (e.g., lethargic, uninterested, pale look, a thin and lean man lying on a bed surrounded by his worried parents etc.). The backtalk can be analytically or reasonably justified to infer the emerging intuitive interpretations. The analytical reasoning means clues are interpreting on sound knowledge and reasonably justified as some aspects may be ignored to move forward to establish awareness of detail in a fuller manner. For instance, the patient presented with stomach discomfort and looked very weak and lethargic. All the blood reports were fine, but the patient looked so tired, weak, with a history of weight loss, difficulty with swallowing and his whole family around him

were genuinely worried. These clues coupled with three recent presentations in the emergency medicine department were enough to convince the junior doctor to give priority to the patient's sick look and to ignore the blood report. The junior doctor interpreted the situation by suspecting that something, such as cancer (malignancy), was seriously wrong with the patient. The aesthetic clues and backtalk, verbal information and evidence facilitate each other and support the whole process of medical decision-making.

These findings contribute to the literature on decision-making (Durning et al. 2011; McBee et al., 2015; Croskerry, 2009b; Norman, 2009) that suggest a significant influence of contextual factors on cognition during the problem-solving process. The study illustrates that contextual factors facilitate medical decision-making through the role of actions and body sensory clues, and with this I contribute to the stream of literature (e.g., Croskerry, 2009b; Durning et al., 2011; McBee et al., 2015) that stresses the importance of contextual factors in medical decision-making. Durning et al., (2011) argue that contextual factors and clues increase the cognitive efforts in diagnosis-making. Indeed, they consider contextual factors as hindrances to effective decision-making. However, I advance this literature by showing that organised actions and body sensory clues and the application of knowledge can use the contextual factors as a facilitating source in the reasoning and problem-solving processes. These complexities are an inseparable part of any medical context (Patel, Sandars and Carr, 2015). I advocate that such contradiction in findings is caused by the methodological limitations associated with using videotapes as a data collection tool (Durning et al., 2011). This is limited because when we show the video recording, the doctors are watching but are not bodily involved in the diagnosis process to capture the tacit clues, emotions and feelings in the context. Without the active involvement of body in actions, it restricts the facilitator role of actions and kinaesthetic and aesthetic sensory clues on the cognition during the diagnosis, and consequently, increasing the contextual factors may increase the cognitive efforts of the doctors. Hence, I argue that the Durning et al. (2011) findings support my demonstrations; i.e., organised actions, body sensory and the application of knowledge can use the contextual factors as facilitators in diagnosis-making. My findings show that contextual factors generate a specific set of backtalk that enables

doctors to recall related knowledge and organise a search for related information in the given situation and decide on actionable plans. In other words, the contextual factors play a central role in guiding physicians' actions and cognition during decision-making.

7.1.2 Summary

The study significantly extends our understanding of how junior doctors maintain mindfulness (Weick and Sutcliffe, 2006; Weick et al., 1999; Epstein, 1999) of all aspects of practice and simultaneously process information (Norman et al., 2009; O'Neill et al., 2005; Durning et al. 2011) that sparks doubts, uncertainty or enables them to recognise a problem. The study illustrates that initially, junior doctors pay attention to aesthetic and tactile clues with a basic level of mindfulness (*personal engagement*) that junior professionals can exhibit (Kabat-Zinn, 2003) as being present in the moment. At this level, a problem sometimes emerges as a surprise (Schön, 1983). With increasing complexity in practice, the aesthetic clues, coupled with basic information, enable junior doctors to recall related knowledge (such as 'mindlines') that subsequently allows them to organise a further search of related information and clues in situ. In this interaction, on the one hand, the problem may arise due to lack of theoretical and/or embodied knowledge, but on the other hand, the practitioner may feel a lack of information, which leads him to the use of tools and technology to explore further information. The tools and technology provide evidence-based information. During all these activities, junior professionals unconsciously and sometimes consciously evaluate their actions by comparing them with those of experts. This activity makes them realise any problem in their actions and sparks feelings of uncertainty and doubt. Finally, the triangulation of aesthetic and tactile clues, verbal information and evidence are processed analytically and intuitively at the same time to make distinctions, where intuitive interpretations can be scrutinised by mindfulness of bodily captured tacit clues/backtalk. The findings illustrate that contextual factors facilitate medical decision-making through the role of actions and body sensory clues play, and with this I contribute to the stream of literature (e.g., Croskerry, 2009b; Durning et al., 2011; McBee et al., 2015) that stresses the importance of contextual factors in medical decision-making. Moreover,

if a doctor has the required knowledge, the process mentioned above also represents the problem-solving process.

7.2 When and why social and material resources are used in the problem-solving

7.2.1 Developing modified and/or new mindlines for problem-solving

In the above section, I showed that there are at least four distinct problematic situations that indicate a knowledge gap, which needs to be overcome in order to proceed towards problem-solving. It means there are many instances in the practice of junior doctors, where the existing knowledge or mindlines (Dewey, 1933; Gabbay and Le May, 2004) on which doctors base their actions to solve the problem, appear to be exhausted. The identified knowledge gaps do not represent a general learning need, but rather the specific and precise knowledge that is required there and then in a specific problematic situation. These knowledge gaps may be due to a lack of tacit knowledge related to embodied knowledge, and/or explicit knowledge of theories, policies and use of tools and technology. By exploring the use of social and material resources of information and knowledge during the problem-solving process, a new mindlines can be constructed. My study offers a way forward for a deeper and more balanced understanding of the use of social and material sources of knowledge in healthcare settings (Ferlie et al., 2013; Nicolini, 2013; Gabbay and Le May, 2004; Wenger, 1998) and looks at when and why junior doctors use social and/or material resources in problem-solving.

The study illustrates that junior doctors utilise social (colleagues, senior doctors, nurses, pharmacists etc.) and material resources (online database, protocol guides, books, policy manuals etc.) to build on the existing knowledge and develop added solutions that are represented as a modified and/or new mindlines in the study. As an illustration, a junior doctor encounters a patient with a disease she knows nothing about (e.g., Charles Bonnet syndrome, a specific fracture type etc.). The current knowledge/mindlines (Dewey, 1933; Gabbay and Le May, 2004) of the doctor are exhausted in terms of offering a solution in a given situation. The junior doctors talk, discuss and collaborate with other healthcare professionals (social resources), and also use online databases, protocols, guidelines etc. (material

resources) in the flux of action as knowledge sources to construct a new mindlines or modify existing mindlines to solve the problem in hand. In light of the findings of the study, I theorise such potential new solutions as the '*modified and/or new mindlines*'. The '*modified and/or new mindlines*' is the most relevant and applicable knowledge in a given situation and provides the solution to the problem in hand. The *modified and/or new mindlines* corresponds and should correspond to the problem, as in Dewey's metaphor that describes how the key corresponds to the lock (Dewey, 1938, p. 178). For example, the junior doctor instantly reads about "Charles Bonnet syndrome" to learn how to manage the patient and talks to a colleague to find out more about "toddler fracture" and its management. So, the use of material and social resources helps junior doctors to expand their knowledge base and to modify the mindlines that are required to solve the problem.

Moreover, the literature remains limited in its suggestion on how junior professionals may learn to interpret situated clues or backtalk, since backtalk is responsive to the actions of the practitioner in a given time and situation (Tsoukas and Yanow, 2009; Schön, 1983). The study contributes to this stream of literature by demonstrating that prompt use of social and material resources enables junior doctors to learn the 'acquisition and interpretation of backtalk' and to develop a modified and/or new mindlines. For example, if the problem is related to the interpretation of backtalk (e.g., what do the tired and uninterested looks of a child with gastritis mean, and what could be causing pain in an eye of the patient by looking into the eye—refer to Page, 124, 149 for further detail), the junior doctors instantly looked for a knowledge resource (e.g., speak to a nurse, check an online database) to help with interpreting the backtalk, and to create a tailored 'modified and/or new mindlines' (i.e., the learning that an uninterested look may indicate a low glucose level, and visual learning to recognise that the presented eye injury is called 'corneal flash burn' and how to manage such conditions) to solve the problem. In the process of using social and material resources to develop a modified and/or new mindlines, junior doctors develop both tacit and explicit knowledge related to 'gastritis' and 'corneal flash burn'. Junior doctors, therefore, build a bank of assumptions and interpretations of backtalk in a given situation with the immediate use of available social and material resources.

Furthermore, there are mixed findings in the relevant health research about the use of social and material sources of knowledge (text, online databases and guidelines, member of CoP) (Gabbay and Le May, 2004; Casebeer et al., 2002; Cogdill et al., 2000) in problem-solving. Some suggest that explicit sources of knowledge such as online databases and guidelines are equally helpful resources (Casebeer et al., 2002; Cunliffe, 2002; Kalsman and Acosta, 2000; Podichetty, Booher, Whitfield and Biscup, 2006) for acquiring knowledge during problem-solving, whereas some suggest they are rarely used in actual practice (Gabbay and Le May, 2004). Gabbay and Le May (2004) claims that expert GPs never used an online database or guidelines as “—not once in the whole time we were observing them. Neither while we observed them did they read the many clinical guidelines available to them in paper form or electronically, except to point to one of the laminated guidelines on the wall in order to explain something to a patient or to us” (page 2). This study contributes to such debates by empirically showing that junior doctors talk, discuss and collaborate with other healthcare professionals, and also use online databases, protocols, guidelines etc. in the flux of action as knowledge sources to modify and develop new mindlines to solve the problem in hand. The findings also show that the junior doctors draw on both social and material resources, which are equally important in them developing a potential solution to the problem. These findings are in line with Gabbay and Le May’s (2004) conclusions of reshaping mindlines during the problem-solving process and advances our understanding as well. In the next section, I will discuss nuance detail of the use of social and material resources during the problem-solving process amid an activity.

7.2.2 Distinguishing the functional use of social and material resources in the problem-solving

The study reveals that professionals can make a distinction between using social and material resources in the problem-solving process in a pragmatic way. In this respect, the decision of how to distinguish resources greatly depends on junior doctors’ ability to ‘translate the problem in professional language’ (or the process of understanding the problem, ‘bracketing’: Weick, 1995) with the help of the selected information and knowledge in a given situation.

The study demonstrates that “translating the problem by using the professional language” is a process of paying attention and being responsive to pertinent situated clues collected during the problem recognition process. The finding of translating the problem elucidates the contemporary literature on sense-making, and specifically the notion of ‘bracketing’ of the problem (Weick, 1995; Weick and Sutcliffe, 2006). Since I have discussed the various aspects of professional practice, namely, personal engagement, systematic approach to activity, attention to the big picture and meaningful comparison, revisiting these activities and making sense of the situation enables junior doctors to define and translate the idiosyncrasy of the problem in professional context.

The study also shows that in this process of sense-making and translating problem in professional language, junior doctors are either able to define the problem in *sophisticated* language or *crude* language. Defining a problem in *sophisticated language* refers to articulating the problem in professionally meaningful terms, such as ‘*how to manage the ‘pityriasis rosea rash’*’. This is an example illustrative of *sophisticated language*. On the other hand, defining the problem in *crude language* suggests that junior doctors are not able to articulate the problem in professional language. If the junior doctor describes the problem as ‘*I don’t know what it [rash] is*’; the doctor talks about the tiredness and uninterested look of the patient, these are illustrative examples to indicate the meaning of the crudeness of language in defining the problem.

Further, the study uncovers that the level of ‘sophistication’ and ‘crudeness’ of language in problem definition specifies the pragmatic selection of material and social resources respectively, in the problem-solving process. In a situation where junior doctors can define the nature of the problem in a sophisticated way, the material resources are often used to solve the problem effectively. So, in the situation where the problem is defined in a sophisticated medical jargon, junior doctors have used and intended to use material resources such as online databases, guidelines etc. as knowledge sources to solve the problem. On the other hand, if the problem is crudely defined in professional language by the junior doctor, the use of social resources is most effective in the problem-solving process. For instance, if the junior doctor observed a physical clue (crude language: rash - unable to define the specific

nature of the rash, nor the cause of the tiredness and uninterested look) but remained unable to describe it in professional language. Consequently, she used social resources (talked and work together with senior doctors to recognise the nature of rash and management, spoke to the nurse about uninterested looks of the child) in such problem-solving.

The findings contribute to the debate on the use of social and material resources during problem-solving and learning in general (Nicolini, 2011; Lave and Wenger, 1991; Wenger, 1998) and specifically in healthcare (Gabbay and Le May, 2004; Dopson and Fitzgerald, 2005; Cogdill et al., 2000; Ferlie et al., 2012; Cabrera and Cabrera, 2005). Firstly, Gabbay and Le May (2004) argue that expert healthcare professionals rarely use material resources (databases, guidelines, protocols etc.) to modify their mindlines in problem-solving and mostly rely on social interactions with a ‘famous doctor’ (p. 3). Further, Gabbay and Le May (2011) also state that online databases, guidelines and formal training act as knowledge in constructing mindlines. As this study explores the problem-solving process, the findings are in line with the construction of mindlines where doctors use all sources of knowledge in constructing personal guidelines. Specifically, the study advances our understanding of the selective use of social and material resources for specific problems in hand and developing related mindlines. My study illustrates that junior doctors use a combination of social and material resources in problem-solving. It shows that even if junior doctors initially use social resources to facilitate them to translate the problem in sophisticated language, they then use material resources to clarify the problem-solving process further.

As well as aligning with Gabbay and Le May’s (2004) study, the findings extend their theorisation by revealing when and why social and material resources are used in problem-solving. Gabbay and Le May (2004) also state that during their empirical investigation of expert GPs they never used online database or guidelines “not once in the whole time [of observation]” (p. 2). In my study, I did observe the junior doctors using online databases and guidelines to develop new mindlines for problem-solving. One possible explanation for this, according to this study, is that when GPs use social resources, their problem is crudely defined in language that hinders the effective use of material resources. Subsequently, when GPs use social

resources, they are able to sophisticatedly define the problem in professional language for themselves, which then enables them to use material resources (online databases, guidelines etc.). It means that most of the time, expert professionals already have the explicit knowledge (i.e., related to protocols, guidelines etc.) required to perform the everyday tasks, as opposed to junior doctors, who are still at the stage of building both their explicit knowledge and tacit knowledge.

Further, it could also be possible that material resources are underutilised in the problem-solving process, as indicated by this study. Underutilised means they are not being used where they could be used as an effective source of knowledge in problem-solving. For an illustrative example, see the management of a sophisticatedly defined problem as ‘managing an open fracture’ (see page 148 for details) where the junior doctor used the social resource of talking to the senior doctor. Several similar cases show that junior doctors used social resources such as colleagues, senior doctors, nurses etc. even when they could use the material resource (online database). The frequent use of social resources and ignoring the use of material resources can be due to several reasons, as in the case of Cyert and March (1963), who hypothesised that professionals start their search for sources with the most easily accessible one (Tversky and Kahneman, 1973) during the problem-solving process. So, it can be inferred that the reason for the infrequent use of material resources is because the junior doctors felt uneasy in deriving information from online databases.

Moreover, the study also shows that even when the problem is sophisticatedly defined, the junior doctors use social resources, as they think the complexity of the task is beyond the scope of their responsibility. For example, in a situation where a minor mistake could lead to severe consequences and the task is beyond their jurisdiction (e.g., managing a brain bleed, cardiac arrest, abdominal aortic aneurysms, etc.), junior doctors involve social resources such as nurses, colleagues, senior doctors, etc. to maintain safety and manage the complex activities. These findings are supported by previous research findings and suggest that during the problem-solving process, people involve other team members to share the responsibility and accountability for the outcomes (Harvey and Fischer, 1997; Yaniv, 2004).

The study extends and contributes to current literature on the use of the social and material resources in organisational settings (Lave and Wenger, 1991; Gabbay and Le May, 2004; Ferlie et al., 2009). Chiefly, my study contributes to this debate by showing that practitioners can distinguish between the use of social and material resources depending on how sophisticatedly or crudely the problem is defined and by evaluation of the possible associated risk and their own scope of responsibility in a given situation. The study also shows that there are exceptions to show that even when the problem is sophisticatedly defined, the junior doctors use social resources as they think the complexity of the task is beyond the scope of their responsibility.

7.3 The process of selecting and using a specific resource in problem-solving

The distribution of knowledge and information across organisational resources (social and material), and their availability in terms of contributing to solving the problem are not homogenous within organisational settings (Nicolini, 2013; Gherardi, 2001; Engeström, 2000; Dopson and Fitzgerald, 2005; Cogdill et al., 2000; Ferlie et al., 2012; Cabrera and Cabrera, 2005). Furthermore, Dopson and Fitzgerald (2005) argue that the decision and choice to use information and knowledge-seeking mechanisms is not straightforward in healthcare as they need a varied knowledge base at any given time to solve the problem. Similarly, my study shows that junior doctors are selective in choosing specific sources of information and knowledge to develop a modified and/or new mindlines during the problem-solving process. The conscious and thoughtful decision on the selection of a specific resource plays an important role in developing a reliable and authentic 'modified and/or new mindlines' in a given situation. The study explains the related decision and thought the process in the selection of specific resources as follows.

The findings enlighten that the selection of material resources is highly dependent on the junior doctors' ability to define the problem in sophisticated professional language and on a specific professional knowledge set related to the availability of authentic and reliable IT sources, and how to use them to create the modified and/or new mindlines. Second, the study shows that the selection of specific social resources mainly depends on the evaluation of three aspects of

potential social sources; namely, 1) matching the complexity of the problem with the expertise of the person, 2) their availability and 3) their willingness. The matching of expertise with the nature of the problem provides a wider range of social resources, which is dependent on the complexity of the problem. It means that with various levels of difficulties present in the problems, junior doctors engage different healthcare professionals such as nurses, colleagues, pharmacists, senior fellow doctors and consultants. For example, if the problem is simply to follow a basic procedure such as drawing a blood sample, the junior doctor knows that nurses, colleagues, and senior fellows all have the potential knowledge and expertise. On the other hand, if the problem is more serious and consequences can be fatal, the junior doctor tends to use highly specialised senior doctors, just as was the case in the management of a suspected leakage of an ‘abdominal aortic aneurysm (AAA)’; the junior doctor specifically called the ‘vascular surgeon’ to discuss the matter (see page 162 for detail). The assessment of the expertise of other professionals when deciding whether to involve them in a given situation is based on the clues and evidence, that is, the junior doctor’s pre-acquired knowledge about people working around her—who is who, who does what, who is good at what (Wenger, 1998) and who are ‘popular doctors’ (Gabbay and Le May, 2004, p. 3).

Further, junior doctors assess the availability of potential social resources and the need to take action to reach the specific colleague, senior doctors, nurse etc.; i.e., by creating the availability of potential social resources. These findings that assess the expertise and availability of potential sources of knowledge, in line with the thinking of Borgatti and Cross, (2003), demonstrate that effective information seeking is very much dependent on the skills and availability of other healthcare professionals. Moreover, junior doctors make efforts to create the availability of potentially useful resources. Findings show that junior doctors use tools and technology promptly (telephone, patient management system, bleeper [hospital pager], etc.). For this purpose and walk around the department to engage in face-to-face interactions with potential colleagues, senior doctors and nurses who can provide the most suitable advice, as per the requirements of the situation, in order to solve the problem. The issue of creating availability is not so much a complex process but requires a dedication to utilising various tools and technology, knowing

how they work in hospital settings. Therefore, at times, the junior doctor just needs to walk, make calls and use the pager (bleeper) to establish the availability of a specific person to ask for help/advice. In some instances, the junior doctor needs to see some symptoms in the patient and to know what it is, as part of the problem-solving process. Then the junior doctor can find a person and personally request their advice or can request that they discuss the matter with them.

Furthermore, the complicated aspect of the use of specific social resources is making a judgement on the 'willingness' of that person to help in that particular situation. The 'willingness' of the source means he/she is wholeheartedly able to provide the specific knowledge that the junior doctor requires. The findings suggest that the junior doctors thoughtfully put effort into creating willingness in the colleagues, senior doctors and nurses by appreciating their expertise and help in a given situation and using the concept of shared responsibility. First, the study highlights that junior doctors also create willingness in others by acknowledging a specific person's expertise and by appreciating her help in the problem-solving in the midst of practice. For instance, when a junior doctor encounters a problem and needs help from another healthcare professional, who has been thoughtfully selected because of the expertise match and availability in a specific situation, the junior doctor uses phrases to acknowledge her expertise and appreciate her help in the given situation. For example, '*your technique of doing LP [lumbar puncture] is excellent*' (see page 161 for detail); '*She is very good at picking up on x-ray*' (see page 164 for detail). Using social skills helps the junior doctor to create the willingness of social resources to help in a given situation. It has also been suggested by previous empirical research that people are more likely to share their knowledge when they are given importance, and their knowledge is appreciated in a given context; this then acts as a reward for sharing their knowledge (Liu and Fang, 2010; Lengnick-Hall and Lengnick-Hall, 2003).

Second, junior doctors create the willingness of others to help in a given situation with the help of the hospital working structure that is based on shared responsibilities and accountability in healthcare professionals. This shared responsibility and accountability create a sense in junior doctors that the 'willingness' to shared knowledge can be created by reminding another person that

the matter of concern is a shared responsibility. For instance, junior doctors would say, 'I need your help in this matter, or if you suggest I document that after discussing it with you, we are discharging the patient'. The creation of willingness is based on shared responsibility and joint accountability in organisational settings (Raelin, 2001; Noe et al., 2003) that can be used in a given situation to derive knowledge through social resources as part of the problem-solving process. These findings are akin to the previous empirical research, which suggests that collaborative and shared work structures can motivate employees to share knowledge in the workplace (e.g., Kim, Newby-Bennett, Song, 2012; Reinholt, Pedersen and Foss, 2011). Thus, one of the ways to create willingness of social resources is facilitated by an organisation's structure of shared clinical governance (Sally and Donaldson, 1998; Travaglia, Debono, Spigelman and Braithwaite, 2011). Consequently, junior professionals can develop their knowledge to solve the problems.

On the other hand, there could be a situation when a junior doctor may not be able to select the right person because the process of the selection of a suitable healthcare professional involves the junior doctor's embodied and personal knowledge, to make judgements on the expertise, availability, and willingness of others. However, in such a situation, the study uncovers that there can be two consequences. First, the mismatched social resource guides the junior doctor to a suitable person (social resource) in a given situation. For example, when a junior doctor went to her consultant to review the x-ray of a child's fracture, she advised her to discuss the x-ray with Dr XXXX (registrar); the consultant guided her towards the right person as that registrar had worked in orthopaedics for many years (see page 163 for details). This is again due to the organisation's structure of shared clinical governance (Sally and Donaldson, 1998) in the hospital setting. Second, an incompatible social resource may also make some suggestions and give advice. If the doctor encounters such discrepancies in suggestions, the study suggests evaluating the recommendations in terms of realities on the ground before implementing them in the given situation (Dewey, 1933), can minimise or redress the possibility of error.

If the suggestions are not appropriate in terms of what is needed to solve the problem, Yaniv (2004) suggests that the junior doctor discounts the advice; in this

case, she evaluates the advice in grounded realities and finds the advice is not supported by situational evidence during the problem-solving process. In such situations, the doctor starts her search for a social resource again in order to find someone suitable. For example, in the case of the junior doctor managing a patient with a toe infection (the guidelines suggest that if the patient has no established infection, the doctor should not prescribe antibiotics unless there is a high risk of developing an infection in the near future), the senior fellow suggested a bandage without antibiotics. However, the junior doctor evaluated the suggestion in grounded realities; i.e., the patient's foot hygiene was poor, with poorly-managed blood sugar levels indicating a high risk of infection. The junior doctor established a high risk of infection in the near future and discounted the registrar's suggestion (see page 167 for detail). Subsequently, the junior doctor searched again for a suitable person to discuss the situation and found a diabetic nurse. They both then decided to give antibiotics to the patient.

These findings provide extended practical guidelines on how professionals can modify their 'mindlines' (Gabbay and Le May, 2004, p. 3) during problem-solving in the flux of activities. Gabbay and Le May (2004) argue that the selection of social resources in problem-solving is chiefly based on expertise; i.e., previously-held knowledge about colleagues and other healthcare professionals working in the vicinity. This study advances our understanding of reshaping 'mindlines' and suggests that besides the expertise of a specific person, her availability (Borgatti and Cross, 2003) and willingness to help in a given time and space also influence the processes of utilising social and material resources in the problem-solving process. Further, junior doctors also use the advice discounting technique (Bonaccio and Dalal, 2006; Yaniv, 2004; Yaniv and Kleinberger, 2000) to refute the poor advice and move on, looking for another source of reliable advice to solve the problem.

This research work does not explore the influence of pre-existing social ties and relationships such as friendships, close attachments etc., but focuses on exploring how the willingness of a social resource is created in the midst of activities, by a junior doctor. These social relationships, such as pre-existing mutual relationships and friendships with each other (Korica and Molloy, 2010) can influence the selection of social resources and affect the quality of resulting new

mindlines and the problem-solving process. This is because strong social relationships in the workplace may facilitate a junior doctor to find more members of the community willing to help, but there is also a danger that due to socially attached relationships, a junior doctor may just focus on those people with whom she already enjoys a social bond but who may not be suitable in a given situation. Further research is required to explore how socially-attached relationships may influence the quality of a developing related knowledge base to solve the problem in the midst of actions.

In summary, the study provides a comprehensive, multimodal empirical analysis of problem definition in mundane jobs and on solving them in the moment to remain effective in the practice. I organise a more grounded, detailed and nuanced conceptualisation elucidating how junior doctors' ability to recognise and solve the problem in the midst of practice can be developed to minimise errors and improve the quality of care. By illuminating the literature on mindfulness, information processing, sense-making, and problem-solving, I construct a more detailed theoretical foundation to understand how professionals work in organisational settings with social and material resources and how they can achieve the status of expert (Dreyfus and Dreyfus, 2005). In conclusion, this study contributes to the literature on the use of social and material resources in problem definition and solving in the midst of an activity (Norman et al. 2009; Benner and Tanner, 1987; Casebeer et al., 2002; Weick, 1995; Weick and Sutcliffe, 2006; Gabbay and Le May, 2004; Weick and Putnam, 2006), and responds specifically to recent calls to investigate how novices learn to realise and solve the problem in management literature (Yanow and Tsoukas, 2009) whilst extending the health sector literature on problem-solving (Norman, 2009; Dopson and Fitzgerald, 2005; Cogdill et al., 2000; Ferlie et al., 2012; Cabrera and Cabrera, 2005; Gabbay and Le May, 2011). In this endeavour, the study offers a theoretical model of problem definition and problem-solving in the flux of activities.

8 CHAPTER 8: CONCLUSION

8.1 Introduction

The investigation aims to explore the problem-solving process of junior doctors in real work settings in order to develop and maintain expertise and practice safely. In this endeavour, this study accentuates the importance of understanding how junior doctors able to identify their learning needs by encountering problems and solving them with the use of various knowledge sources is a fruitful endeavour. In order to ensure the relevance of my data, I used data from shadowing (24 junior doctors for 45 days), artefacts (over 300 reflective logs, online databases) and interviewing (n=22) junior doctors in two departments of an NHS England trust hospital from June 2014 to August 2015. The analysis and discussion on this rich mass of data provided subtle insights into the various aspects of manifestation of mindfulness and information process during the junior doctors' practice that enable them to recognise the problem and use of social and material resource to solve such problems in the midst of the action. This Chapter concludes the study in the following sequence. First, I summarise the main findings of the study to elucidate how I achieved the objectives of the study. Second, I explained the practical implications of the findings followed by the limitations of the study and future research directions.

8.2 Summary of the findings and contribution to knowledge

In order to effectively solve the problem in a real work setting, junior doctors are required to understand 1) how they realise the problem in action that indicates knowledge gaps, and 2) subsequently fill that knowledge gap with the help of effectively utilising social and material resources and solve the problem. The study shows that in the problem-recognition process, two aspects are essentially important: information and clues collection and interpretation to be able to articulate the problem in action. The study illustrates that initially, junior doctors pay attention to aesthetic and tactile clues with a basic level of mindfulness that junior professionals can exhibit (Kabat-Zinn, 2003) as being present in the moment. The aesthetic and

kinaesthetic senses enable junior doctors to capture tacit clues in the context. At this stage, a problem emerges as a surprise (Schön, 1983). With increasing complexity in practice, the aesthetic clues coupled with basic information enable junior doctors to recall professional knowledge, which subsequently guides junior doctors' bodily actions to operationalise aesthetic and kinaesthetic senses in capturing all possible related information and enables them to ask related questions. In this interaction, on the one hand, the problem may arise due to a lack of theoretical and/or embodied knowledge, and on the other hand, the practitioner may feel that a lack of information leads to the use of tools and technology to explore further information. The tools and technology provide evidence-based information. During all the activities, junior professionals unconsciously and sometimes consciously evaluate their actions by comparing their actions with those of experts. This activity makes them realise problems in their actions and sparks feelings of uncertainty and doubt. Finally, the triangulation of aesthetic and tactile clues, verbal information and evidence are processed analytically and intuitively at the same time to make distinctions, where intuitive interpretations can be scrutinised by mindfulness of bodily-captured tacit clues/backtalk.

Therefore, the study significantly extends our understanding on how junior doctors maintain mindfulness (Weick and Sutcliffe, 2006; Weick et al., 1999; Epstein, 1999) of all aspects of practice and simultaneously process information (Norman et al., 2009; O'Neill et al., 2005; Durning et al., 2011) that sparks doubts, uncertainty or enables them to recognise the problem. Furthermore, the study extends the understanding of medical decision-making by showing its situated nature and how it is facilitated by a contextual factor such as clues and backtalk and contributes to the literature on decision-making (Durning et al., 2011; Norman, 2009). The study explicates the concurrent role of body, knowledge and contextual tools and technology in decision-making. My research findings challenge the findings of previous empirical research (such as Durning et al., 2011) which argue that contextual factors and clues increase the cognitive efforts in decision-making. They consider contextual factors as a hindrance to effective decision-making. This study reveals that, although it might be true that if we increase the contextual factors, this can increase the cognitive efforts in problem-solving processing, yet, I

demonstrate that the effective implications of actions and kinaesthetic and aesthetic senses and knowledge can use these contextual factors as assistance in the problem-solving process.

The problem-solving process requires knowledge (Dewey, 1933; Schön, 1987) that offers a solution to the problem in situ. The study shows that when existing knowledge/ mindlines does not represent the solution to the problem, the junior doctors talk, discuss and collaborate with other healthcare professionals (social resources), and also use online databases, protocols, guidelines etc. (material resources) in the flux of action as knowledge sources to construct a new knowledge/mindlines to solve the problem in hand. The new knowledge is ‘modified and/or new mindlines’ in this study. The ‘*modified and/or new mindlines*’ is the most relevant and applicable knowledge in a given situation and provides the solution to the problem. The study reveals that professionals can make a distinction between using social and material resources in the problem-solving process in a pragmatic way.

The study contributes to the debate on the use of social and material resources during problem-solving and learning in general (Nicolini, 2011; Lave and Wenger, 1991; Wenger, 1998) and specifically in the healthcare settings (Gabbay and Le May, 2004; Bennett, et al., 2006). This study contributes by showing that material resources are equally important (Fox, 2006), specifically when the problem is sophisticatedly defined during the problem-solving. These findings extend Gabbay and Le May (2004), who argue that healthcare professionals rely on social interactions in problem-solving and mostly chose to consult social resources in modifying and building new ‘mindlines’. The study extends and contributes to current literature on the use of the social and material resources in organisational settings that suggests both are equally important (Lave and Wenger, 1991; Gabbay and Le May, 2004; Ferlie et al., 2009). Chiefly, my study contributes to this debate by revealing that practitioners can distinguish between the use of social and material resources depending on how sophisticatedly or crudely the problem is defined and the evaluation of possible associated risk and their own scope of responsibility in a given situation.

Furthermore, the study advances our understanding of the use of social resources during the problem-solving process. The study establishes that a problem-solving ability depends on a thoughtful selection of resources to be used in a given situation. First, if the problem is sophisticatedly defined, professionals use material resources and on the other hand, if the problem is crudely defined in the professional language, then social resources are used in the problem-solving process. Further, the selection of specific social resources is based on an evaluation of expertise, availability and willingness of the person to develop a possible authentic solution to solve the problem. These findings provide extended practical guidelines on how professionals can develop their ‘modified and/or new mindlines’ (Gabbay and Le May, 2004, p. 3) during problem-solving in the flux of activities; those are authentic and trustworthy. Gabbay and Le May (2004) argue that selection of social resources in problem-solving is chiefly based on the expertise of other healthcare professionals; i.e., previously-held knowledge about the colleagues and other healthcare professionals working in the vicinity. This study goes beyond such scope of developing ‘mindlines’ and suggests that besides the expertise of a specific person, her availability (Borgatti and Cross, 2003) and willingness to help in a given time and space also influences the processes of utilising social and material resources in the problem-solving process.

In conclusion, this study contributes to the literature on the use of social and material resources in problem definition and solving in the midst of an activity (Weick, 1995; Weick and Sutcliffe, 2006; Gabbay and Le May, 2004; Borgatti and Cross, 2003; Weick and Putnam, 2006; Schön, 1983; Dewey, 1933), responds specifically to recent calls to investigate how novices learn to identify and solve problems (Yanow and Tsoukas, 2009) and extends health sector literature on problem-solving and decision-making (Banning, 2008; Graber, 2003; Hall, 2002; Mamede and Schmidt 2005; Norman et al., 2017; Durning et al., 2011; McBee et al., 2015). The findings can be presented in the following points and have significant practical implications that I will discuss hereafter.

- The mindfulness of aesthetic and kinaesthetic senses in capturing tacit clues.

- Tacit clues enable a doctor to recall related professional knowledge, and subsequently, professional knowledge guides bodily actions to organise the search for related clues and further verbal information.
- The clues and verbal information lead to a search for evidence with the use of tools and technology.
- Then triangulation of tacit clues, verbal information and evidence facilitate decision-making or indicate the problematic situation.
- During all the activities, practitioners keep comparing their actions and thinking with that of experts that have already been embedded in the practitioner's behaviour (existing mindlines).
- Practitioners put efforts into analysing the situation and defining the problem.
- If they can define the problem sophisticatedly in professional language, they use or should use material resources like online databases, books, protocols etc.
- If practitioners can define the problem crudely in professional language, they use social resources.
- Then on the basis of evidence that practitioners have already observed, or if they know a specific person is good at dealing with the emerging problem, they thoughtfully choose to talk, discuss and take advice from that person. Practitioners also think and make efforts to make that person available in a given time and space. Finally, they assess the willingness and try to create it. Regardless of whether that person is willing to help with the problem-solving, willingness can be developed by appreciating a person's skills and help on the one hand, and by helping them to realise it is their responsibility.

8.3 Practical implications

The study has several practical implications for doctors, policymakers, and trainers. The NHS has recently been trying to overcome the cognitive biases on the junior doctors' problem-solving abilities (cf. McMurtry, Rohse and Kilgour, 2016; Murdoch-Eaton and Sandars, 2014; Graber, 2013) and has been proposing to explore the complexities of junior doctors' learning experiences to enhance their reflective learning. There is a significant need to explore how to minimise the error in doctors' decision-making and problem-solving processes. This study contributes to some extent by addressing concerns about junior doctors' decision-making and problem-solving processes.

First, the findings show how junior doctors can maintain their mindfulness in practice and interpret a situation as problematic. With this process, junior doctors are able to recognise the problem in their bodily actions, apply professional knowledge and interpret the information. It helps junior doctors to capture the error-causing factors in-decision making (Lorincz et al., 2011; Graber, 2013), minimise errors and enhance learning opportunities. Second, the study shows that online databases, guidelines, protocols etc. are effective tools in the problem-solving process, but they appear underutilised in a hospital setting. The policy maker can consider that this may be because junior doctors feel uneasy in using material resources to derive information from online databases. Yet the effective use of material resources helps junior doctors to engage effectively with self-learning, as it makes them more independent than others. I suggest that appropriate training and guidance related to the awareness of authentic sources, training in using technology to access the source, and time management are important factors for the effective utilisation of material resources. Thirdly, during the problem-solving process, junior doctors are advised to think carefully about whom to go to for advice, considering why that person has the right skills and is willing to help. In this way, the junior doctors' quality of learning will improve.

Finally, considering the findings of the study, I propose questions that should be included in reflective logs to appreciate the complexities of experience and learning in everyday work (see table 8.1). The study suggests that reflective learning

can be strengthened by focusing on the complexities of the problem recognition and problem-solving processes, as illustrated in this study. That is, what are the situated clues, how have they helped in recalling related knowledge to organise a search of further information and clues, what is the emotional and physical evidence that has been interpreted, and how did various social and material resources inform understanding of the problem and enable the doctor to solve the problem? Further, what kind of information, knowledge or skills were missing that had been learnt during the problem-solving; i.e., learning as the acquisition of new information and skills (Hitt, Keats, and DeMarie, 1998; Barrows, 1986;)? It enhances the probability of problem recognition and solving in everyday work and hence, enhances patient safety.

Table 8-1: Suggested reflective log questions.

Existing questions in the reflective log	Proposed questions based on findings
What happened?	Briefly, explain the situation. i.e. What are initial clues that helped you to recall related knowledge; How related knowledge helped in organising the search of further information and clues, what, if any, were the tools and technology used to see the broader context?
What, if anything, happened subsequently?	What were the feelings and evidence that helped you recognise 1) a knowledge gap and 2) that you needed help? i.e. How did you articulate recorded clues as problematic, and why?
What did you learn?	Reflect on how you decided to select social resources or using the online database and artefacts? i.e. Try defining the nature of the problem?
What will you do differently in the future?	What were the clues that indicate you the expertise of a specific colleague can be helpful to consult in order to bridge the knowledge gap?

What further learning needs did you identify?	How did you manage to get help from a specific colleague to manage the situation? i.e. Reflect on how you made her availability and willing to help in a given situation.
How and when will you address these?	What did you learn for the future? What did you become after managing this situation? i.e. What can you do now, that you could not do before this experience?

These questions will motivate the junior doctors to capture the related complexity of their experience, as they will explain how tacit clues were captures, describe the effective knowledge base, and explain why they talked and discussed the problem with colleagues, senior or other healthcare professionals as part of the problem-solving process. The existing reflective logs are criticised as they are often a brief summary of the event and do not capture the complexities of problem-solving and learning (Berland and McNeill, 2010), but this is overcome with this new set of reflective log questions. Because the log incorporates the learning of the junior doctor as a social process and includes interactions with social and material resources, and aesthetic as well as emotive and ethical resources, the knowledge is embedded in practice (Gherardi, 2007; Casey, 2005).

Further, because of criticism that expecting junior doctors to report their errors voluntarily is confusing (Hobbs, 2007) and the recent incident when the courts used the reflective log against a trainee doctor and struck her off the general medical council (Dyer, 2018), the trainee doctors are very conscious about what to write in their reflective logs. Here, my proposed reflective questions show a complete learning cycle, where junior doctors are able to recognise the problem and then utilise various social and material resources to tackle that problem in the midst of the action. It means that junior doctors are not reporting their errors or mistakes, but they are reflecting on how they actually saved the patient's life with the timely identification of the problem and being able to solve it by using available resources.

Therefore, the study contributes by proposing a set of reflective log questions that enable junior doctors' learning from experience in all aspects. Such as, it enables a development of embodied engagement in practice, a learning of explicit theoretical knowledge, skills development (epistemological learning) and more importantly, it develops an understanding of how to learn with social and material resources (Maitlis and Lawrence, 2007) and how to be in the flux of practices and social and material resources (ontological learning; see Clegg et al., 2005). The proposed reflective log, therefore, incorporates both epistemological and ontological learning from experiences and an understanding of the complexities of problem-solving skills. Last but not least, my thesis suggests that absence of knowledge is not an equivalent ignorance for problem solvers, but the absence of knowledge is state of wonder, mystery and possibility of using social and material resources to fill that knowledge gap to remain reflective in our actions.

8.4 Limitations and future research directions

This research project has three main limitations, which were unavoidable under the constraints of available resources such as time and financial restraints. Firstly, the study is carried out in one NHS England trust hospital. Twenty-four participants were recruited for shadowing and interviews, which limits the transferability of the study to some extent. The problem was addressed in the research design with the prolonged engagement and rich descriptions (Denzin, 1989) of the junior doctors' context and practice in hospital settings. Moreover, I have provided a rich account of research design and method in Chapter 3; this can be independently repeated in other NHS hospitals and is very helpful for future researchers in terms of the potential to explore the phenomenon in other professions to verify the extent of transferability of the study's findings in other fields. It describes two basic boundary conditions to generalise the findings. First, the organisational context should be based on collaborative work, i.e., assignments and responsibilities are shared among different groups and teams in the organisational settings. Second, the study suggests a model of the problem-solving process that can be equally effective in professions that are significantly dependent on profession-based knowledge, with workers known as knowledge workers (Blackler, 1995). On this basis, I suggest that the proposed

model may be equally applicable to other professions such as engineering, software development, law, and business consultancy, but needs to be carefully tailored according to the needs of the given profession and industry. I recommend further research in various professions to find the role of social and material resources in the problem-solving process using this study as a framework, to establish the transferability of findings.

The second limitation of the study is related to the scope of research, which explicitly focuses on diagnosis decision making and junior doctors' associated learning. Further understanding of the implications of the use of social and material resources could have been obtained by focusing on junior doctors' workplace problems, such as coping with organisational politics, maintaining identity, conflicts of interest in team members and preserving mental and physical health at work. I suggest future researchers are tasked with exploring how doctors/professionals may use social and material resources in coping with organisational politics (c.f. Coopey and Burgoyne, 2000), maintaining identity (c.f. Korica and Molloy, 2010), managing conflicts of interest in team members (c.f. Somech, Desivilya and Lidogoster, 2009) and maintaining mental and physical health at work (c.f. Thoits, 1995). The insight generated from every suggested future research will further advance our understanding of the problem-solving process in everyday work in organisational settings. This limitation is unavoidable because when looking at one research project, and due to the breadth of the phenomenon of problem-solving, it was important to set the boundaries of the research to organise and present the findings in a coherent and theoretical manner.

Finally, the main source of data was shadowing, which is susceptible to researcher biases and which can influence the findings of the study. However, in this study, I used various methods of data collection and verified the derived conclusion by effectively applying triangulation to establish the validity of the study. More importantly, to redress the limitation of personal biases in the analysis process, I arranged debriefing sessions (Lincoln and Guba, 1985) with academic supervisors and site supervisors. Most importantly, the member check sessions were used to accurately present their activities and practice (Lincoln and Guba, 1985).

8.5 Reflection on the PhD experience

The experience of a PhD has lifelong learning lessons. In doing research, the biggest challenge in writing my thesis was the data collection from junior doctors and then analysing these in a meaningful manner. I think, I spent at least a couple of thousands of hours in the hospital and talking with junior doctors during the data collection process. These interactions with different people helped me polish my interpersonal skills: specifically, how to ask and make sense of the information that people of different professional backgrounds shared with me generously. Next major learning was the analysis process. The discussions with both supervisors, who helped me learn and hone the data analytical skills, are worth mentioning here.

Further, before writing the PhD thesis, I was not aware of the paramount importance of methods section in any manuscript. I was of the opinion that research is about providing good ideas and findings mostly, but I learned that data analysis and a meaningful discussion of these was a fundamental part of my PhD project. Now, I also understand that the microscopic details on how the data was collected and analysed; both are equally important in the manuscript. These details help the investigator in establishing that her/his findings are credible and worth reading. Further, I understood that the emergence of ideas and findings in the analysis is an iterative process of drafting and redrafting the themes and conclusions again and again while going back and forth to the relevant literature. The process of writing and rewriting contributes greatly to the development and refinement of the ideas and findings, and I believe, it cannot be achieved without this.

Writing a PhD thesis is a long journey, and I concur that one needs to develop some particular personality traits. From my experience, I understand that in order to do research and write a PhD thesis, it is very important that one enjoys what one does, and that one must not lose trust that this endeavour is worth doing. In this way, the hardships one will face in this and any future endeavour, themselves become a reward. I remember countless sleepless nights during my engagement with the literature, writing and analysing data. On balance, I can say, that I have really enjoyed this time; specifically, the knowledge and gained itself was a reward for me. It taught me that no matter what happens one must remain committed and

determined to complete a PhD. All these works, such as doing a literature review, learning about methodology, data analysis and others convinced me about the importance of the need for a diligent engagement with the feedback and guidance received from my supervisors.

In summary, the experience of writing my thesis taught me:

1. How to engage yourself with good quality literature and how to converse with it.
2. How to meticulously follow supervisors' suggestions and advice, and discuss openly with them any difference of opinion. The burden is on the PhD scholar to bring it all together
3. About the uncertainty which is part of the PhD process, and the need to openly discuss any personal problems with the supervisors so that they can understand the hardships one might be going through. I found that supervisors showed a lot of understanding and supported me through my difficult times as they wanted me to accomplish my PhD.
4. About the importance of talking about the PhD work to as many people as possible, and if I could not find anyone, I would tell my PhD 'stories' to my children.
5. How to enjoy my PhD journey and make it worth doing. I think PhD is the biggest individual research project of my life, so I endeavoured to make it meaningful.

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9 APPENDIX 1: OBSERVATION GUIDE AND EXAMPLE OF FIELD NOTES

What was the purpose of shadowing?

1. What junior doctors do and talk about in hospital settings?
2. How various available resources such as online databases, books, protocol guides etc. are used in the reflective actions of junior doctors?
3. What they talk about, with whom they talk and what is the purpose of these talks and discussions?
4. How talks, discussions and explicit resources influence the future actions of junior doctors?
5. How technology and IT facilitate discussions, talks, and availability of explicit resources in junior doctors practice?
6. How they think and act to handle various problems?

Field notes

Extended Field note: Acute medical ward

Date: 27-06-15

Time start: 0850

Time end: 1715

Researcher: Malik Ahmad

Research participant: Foundation trainee doctor (D17)

Age group: 20-25 Years

Gender: M

<p>It is a nice and sunny day, I reached the hospital at 8:50am. It took me about 5 minutes to reach the cafeteria. As we (me and participant junior doctor) have already decided to meet there at 8:45am so that I can accompany the D17 to start shadowing her in the acute medicine ward. After 2-3 minutes I saw D17 coming from the corridor, I started walking towards her, and appreciated her to participate in the research.</p> <p>After that I accompanied the D17 and walked through a complex building of the hospital to the acute medicine ward. After reaching on the door, it was about 9am, D17 swap her card in the door to open it.</p> <p>We enter the ward, the first thing ward nurse asked me was, Hi Malik, you back? I said ya I miss such lovely people so I thought of spending some more time with you. How are you and (Nurse name)? you will find her around, ask yourself.</p> <p>After this hello hi, D17 asked the ward nurse where are the patient files? She pointed towards steel made trolley full of files. There were four nurses in the ward, two were doing some paper work on the main desk. At the meantime, D17 asked the ward nurse how is (patient name) doing? Is she settling down?</p> <p>Nurse, replied, yes she is now much better</p>	<p>Reaching some time before a given time is very helpful in organising your next steps.</p> <p>My warm wellcome and appreciating words appeared helpful in developing good relationships with the participant, although we already met each other 2 times. That is one of the reason I did not interview D17.</p> <p>Security first, nobody can enter the ward without employee electronic readable card, or visit should ring a bell and someone will open the door after asking the identity and purpose of the visit.</p>
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<p>her vital are much better than last night Go and see her yourself. D17: Ya I will, and walking toward the file trolley.</p> <p>There was another document, that is handover file. Before review the patient files, she looked on the morning handover report. She noted down on a piece of paper the name and patient number of three patients. I asked her, why you took these three patient. She replied, 'they are poorly' we need to review them first.</p> <p>After that D17 carefully found the three files of the same patients which she noted from the handover meetings. She was just looking at the file of first patient and the senior level trainee doctor CT2 came in the ward.</p> <p>CT2 doctor told D17 that today she will do the ward round, and also asked D17 in general way, is there any patient need review urgently? Yes Dr. xxxxxx I think today we will start from these three patient. It.</p> <p>Let me see..... Dr xxxxxx hold the files and moves toward the computer desk that is in the middle of the ward.</p> <p>Both junior doctors, start looking into patient management system all the details available in the system. First they open patient management system, and search the patient by putting her name, then they verified the NHS patient number. This is a unique reference number of every patient.</p>	<p>Thank god they remember me 😊</p> <p>D17 show her compassion, she really cares her patients.</p> <p>Getting relevant information from specific resources and prioritising activities.</p>
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<p>First they looked at the most recent investigations and drugs. Then reviewed the whole medical history of the patient. Dr. xxxxx was verbalising the important information, and meanwhile D17 was taking notes of these information.</p> <p>The patient is a type 1 diabetic and was vomiting for 3 days persistently. Last night came to emergence department and was admitted to the acute medicine ward. Doctors are talking about why she waited for that long to seek help. The first assessment was pulse was recorded high somewhat 130. D17 goes to the patient, asked general wellbeing questions, such as how are you feeling now, how many times vomit in last two hours. Moreover, both doctors showed their concern that patient look very dehydrated. So they decided to give the patient some fluid. After that D17 inserted a wide bore venflon, and took a blood sample along with blood gases and asked the midwife to give an antiemetic drug. This was basically to stop vomiting of the patient.</p> <p>After that they went to the next patient, who is also very sick and have multiple problems [10:10].</p> <p>This patient is an old man in late seventies. Before talking to the patient, this time D17 goes to the computer Dr xxxxx (core trainee)</p>	<p>In order to understand the complete picture of the situation, patient management system is a very good resource. It also involves a process of activities those should be followed to ensure that right information is accessed.</p> <p>After, a while I got a chance to talk to D17 and asked how you know patient is dehydrated even there is no test and evidence. She responded that in different situations the look of the patient plays an important role in guessing what can be possible medical harms. For example, the patient is</p>
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<p>accompany her. D17 looks into the patient file and repeated the same procedure as was done on previous patient. But this time D17 is sitting on the chair and using patient management system by herself and narrating important information to Dr xxxx. I mean they search the patient in patient management system and reviewed medical history of the patient. At that time Dr xxxxx said that the patient has history of fall and loss of consciousness last night, nobody has requested the head CT scan (X-ray computed tomography) we should have to request it as soon as possible to rule out the brain bleed.</p> <p>Subsequently, D17 emphasised that Dr xxxxx this elderly patient has multiple health issues. Then D17 explicitly told that the patients kidneys are not functioning properly due to excessive alcohol consumption. After saying this D17, waited for a while for the response of Dr xxxx on this. After that, in this situation, D17 pointed out an important point that the patient's kidneys are not functioning and if we ran a CT scan which means radiologist would give her <u>contrast dye</u>. You know this contrast can badly effect the function of kidneys, it may further worsen the condition of the patient.</p> <p>Now Dr xxxx was suspecting that may be D17 is right, but not able to decide between the pros and cons of CT scan intervention. So Dr xxxxx decided to discuss the matter with radiologist to get advice on CT scan of the patient. So they go</p>	<p>vomiting too many time, it is indication that body is losing water and most importantly have you noticed the lips of the patient they look very dry and white.</p> <p>Here Dr xxxxx were jumping to the conclusion without paying attentions to the details and contextual information. As Dr xxxxx was taking decision just on the basis of current problems and possibilities of this problem.</p> <p>Pay attention to the details help to take reflective decisions, if someone is ignorant of some information she cannot think and reflectively.</p>
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<p>to see next patient.</p> <p>[10:32] Subsequently, Dr xxxx moved to the nurses' desk to make a phone call to the radiologist. During the call she mentioned the patient's general symptoms and suspected problems to radiologist. In response, radiologist asked her the counter questions to establish the need for the scan.</p> <p>While this discussion, she mentioned that the patient's kidneys are not working properly and also quote some test result, and the patient is an old man of 78 years.</p> <p>After that she put the phone down and said she will call us back after discussing her consultant.</p> <p>So for the time being they suspended the decision of requesting head CT scan, and decided to wait for the response from radiology department.</p> <p>[10:45] Subsequently, they move to the next patient. It was relatively recovering patient. Both the doctors and myself went to the next patient. Dr xxxxx introduced herself and D17 and me as researcher, at this patient Dr xxxx just asked general wellbeing questions, and review the patient file and moved to the next patient.</p>	<p>Drawing on existing ideas and anticipating the outcomes.</p> <p>Now for the Dr xxxx in is difficult situation, at the same time she is also looking at even broader picture of the situation. Even though Dr xxxx was not able to realise the arising surprise by herself, it was pointed out by D17. It made Dr xxxx curious to find the answer.</p> <p>Selection of the possible expert available person to reflect on the problem together, is an important point.</p> <p>The radiologist keenly asked specific questions about the patient kidney function and said in</p>
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<p>In the meanwhile, the nurse asks the doctor that it calls for you from the radiology department.</p> <p>Dr XXXX start talking about the first patient, on which she was confused about the CT scan. After the phone call Dr XXXX told the D17 in an appreciating way that she has discussed with the radiologist, you (D17) were right it is not very important to have CT scan of the patient in this situation, and they decided to cancel the SC scan.</p> <p>So nurse came over, and asked D17 to come along and prescribe fluids to (name) patient. D17 replied ok I am coming. Dr XXXX started working on the computer and replying for some important emails [11:16].</p> <p>After that they both see 6 more patients. all</p>	<p>this situation when the patient's kidneys are already affected and not working properly, the contrasts dye used in CT scan can damage the kidneys and it can result in fatal heart failure.</p> <p>I asked the D17 if she is aware what was the discussion about with radiologist. D17 told That radiologist keenly asked specific questions about the patient kidney function and said in this situation when the patient's kidneys are already affected and not working properly, the contrasts dye used in CT scan can damage the kidneys and it can result in fatal heart</p>
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<p>patients were getting better and there was no change required in their drugs just they need to get sample of blood for routine investigations.</p> <p>Ward round was ended about 13:30, and D17 went to lunch break, I also decided to go along. We had our lunch together and again had general discussion.</p> <p>After the break, most of the time D17 keep working on documentations, and requesting some investigations. She requested all the investigations using patient management system. In documentations she prepared the discharge reports of four patients who they have review in the ward round and they all were fine to go home. At the end of her shift she asked the ward nurse that every prescribed medication have given to (patient name) who was very sick. Nurse replied ya doctor. So D17 inform the duty nurse that she is going as next shift doctor is here now. I also thank everybody, and also reminded them that I will come again and next time I will bring some chocolates for the ward.</p> <p>This was the end of the shift of D17.</p>	<p>failure. But radiologist also wanted to consult with her senior radiologist, so now it was the call of radiologist and she strongly suggested not to do the CT scan of the patient, as we are not planning to any surgical interventions in 78 year old man.</p> <p>It was great opportunity for me to get clarification of any confusing point. At that time I talked about the sharing the reflective logs if she had no objection in that it will be of great help for me in my research. She raised the question of anonymity, she said on every page there is my name my supervisor name it is quite difficult to give this document. Hereafter, I said it's alright, if we can somehow figure out this issue I will talk to you later regarding this.</p> <p>Basically, it was the convention in the acute medicine ward, that everyone should bring something to eat for the ward at least in a month. That is why I myself offered</p>
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	that nest time I will bring some chocolates.
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Analytical memo:

The important finding is about the careful attitude that basically inclined the doctors to think reflectively. Just as when both doctors were doing ward round, and one was planning to request CT scan. It was not due to lack of knowledge but due to lack of careful examination of the context, then developing assumptions which support those grounds. It is important aspect of reflective practice. then D17 pointed out one aspect of context which provides ground to 'not doing CT scan'- here one more thing is collecting relevant data/information which guide reflective actions. In the pursuit of information then both doctors discuss the issue with radiologists to clarify and judge the assumptions to implement it in patient management.

Second important aspect is openness in accepting what is right in the ground reality. Just as senior doctor acknowledges that D17 you are right we should not go for the CT scan. The thinking and cognition of doctors is not individual in its nature, they are collecting various part of information to think about by using computer, talks and discussion. Those as essential construct of reflective practice.

10 APPENDIX 2: INTERVIEW GUIDE

How do junior doctors understand reflective practice?

1. How do you define reflective practice?
2. How helpful you find RP in your learning?
3. In what ways you undertake reflective practice in daily routine?
4. Do you think you reflect during your practice? How
5. Do you think e-portfolio is helpful in reflective learning?
6. In order to prepare good reflection to write in e-portfolio what you do?

How junior doctors get prepared to see the professional world and their objectives

7. what are the training and instructions you received before entering the hospital world for practice?
8. How were they helpful in performing your tasks from day one?
9. How did you introduce yourself in the hospital on the first day?
10. What this formal identity means to you?
11. What do you want to achieve from this training post?
12. How you set your learning objectives?
13. What do you like and enjoy most in your job?
14. What do you like in others practice whom you idealise?
15. What do you dislike about your job?
16. What are your aims and objective of being there as a trainee doctor?

17. Do you meet regularly with your supervisor?

18. What do you think you learn from those meetings?

Daily routines and reflection

19. Do you think, your job has some specific routine? Please Tell me about it

20. How useful you find artefacts and database in performing your duties on a daily basis, can you provide some example where database helped you in your performance?

21. If you are doing something wrong, and not know how to go forward, what do you do?

22. Do you think teamwork and interactions with other help you to overcome your limitations, boosting your learning?

23. Do you think these practices and routines are preparing you to be confident in your practice? How?

Social reflection

24. Do you meet regularly with your supervisor?

25. What do you think you learn from those meetings?

26. Do you try to link consultants' practice with theory while working alongside in ward rounds?

27. How do you find the errors or found mistakes or learning needs in your practice?

28. During patient management and follow ups you communicate with different departments by phone, if you reflect on it what are your learnings?

29. How different resource such as patient management system, books, protocols etc. facilitate your practice? can you give some examples?
30. Do you think these practices and routines are preparing you to be confident in your practice? How?

11 APPENDIX 3: SAMPLE OF ‘REFLECTIVE LOGS’

View Log: Clinical Encounter	
Archived Selections	
Name	
3.2 Patient Safety	
3.5 Evidence-based Practice	
13 Care of People with Mental Health Problems	
Current Selections	
Name	Competence
Making a diagnosis/decisions	✓
Clinical management	✓
Managing medical complexity	✓
Date:	25/06/0000
Subject title:	Title
<p>What happened?:</p> <p><p>I was on call for Psychiatry when I was asked to see a patient in one of the ENT wards. He was young male who was brought to A&E after he tried to hang himself with a bedsheet but was found just in time by his partner who used a knife to cut the sheet to rescue him. He was found to be cyanosed and had a ligature mark on his neck.</p></p> <p><p>He, after a period of observation in the ENT ward was found to be fit for discharge and I was called (as part of the liaison psychiatry team and being on call) to do a risk assessment. I did not know about the previous psychiatric history in detail but it was known that he attempted suicide on numerous occasions recently and was referred by his GP to CMHT but was waiting to be seen.</p></p> <p>What, if anything, happened subsequently?:</p> <p><p>Patient was very anxious towards the start of the assessment and told me that he just wanted to go home and that he was feeling fine. To my surprise, he told me, I am not feeling suicidal, I am not going to kill myself, I know that's what you need to know, now can I go home?. It was odd for someone who tried to HANG himself the previous day was feeling fine and telling me that he was not suicidal. I was not comfortable at all to let him go home. I had to objective evidence to support my assessment, he never expressed suicidality, had no planned but...</p></p> <p><p>I was not convinced still.</p></p> <p><p>I tried again to probe him more by engaging him in conversation and very gradually he started telling me that he had been asking for help for a long time but nobody did anything for him. He was assigned a CPN, was known to a resource centre in the past but he was not satisfied. He was being treated for depression but the symptoms persisted. Due to his excessive alcohol and drug abuse, he was discharged from the CMHT and referred to the Community addictions team but he did not engage well.</p></p> <p><p>He tried to kill himself by jumping from a high rise building, he walked in front of the moving cars, tried to hang himself by a neck-tie but it snapped etc. So, he was a man who was in trouble, with very unstable state of mind and a significant risk to himself. I read in the case notes that the patient was seen by a consultant psychiatrist in the recent past so I called her resource centre. She called me back in between the patients from her clinic and told me that although the patient was referred to her by the GP but was not seen.</p></p> <p><p>I called my consultant who I knew was in a meeting, but with the patient pacing up and down the ward to leave, I needed a second opinion urgently. Luckily, I managed to speak to him, who agreed that if I am not comfortable discharging the patient home, I can admit him and detain if needed. In the end I had to detain him under the EDC and arranged a transfer to the Psych. ward. I later called the patient's partner who was more than happy with the plan as she was certain that the patient would try again to kill himself.</p></p> <p>What did you learn?:</p> <p><p>While risk assessments in psychiatry, we follow certain rules and criteria. A patient who has attempted an overdose/SH and remorseful afterwards could be discharged home with appropriate follow up. Or if the patient is having ongoing suicidal thoughts, an admission could be considered.</p></p> <p><p>This patient was different. He had adopted a violent method to try to kill himself. He was lucky to be alive as his partner found him on time. The very next day, he told me that everything was fine, he was not feeling suicidal and wanted to go home as soon as possible. I had a reason to believe that the patient was not being entirely truthful to me. I felt that his safety was my first concern, in took me no less than 4 hours to deal with him and arrange his transfer to a psych. ward, but I think it was necessary. It could have been wrong but some consultant's criticism for an unnecessary admission was better than the completed suicide attempt by the patient.</p></p> <p>What will you do differently in future?:</p> <p>I will further try to get a background and collaborative history while dealing with similar patients. If I had time, I could have spoken with the partner and the GP before detaining him. It might have made the decision making easier, but I had no enough time.</p></p> <p>What further learning needs did you identify?:</p> <p>More practice and awareness of the mental health act to decide who can or cannot be detained.</p> <p>How and when will you address these?:</p> <p>By seeing more patients.</p> <p>Shared?:</p> <p>Yes</p> <p>Date shared:</p> <p>11/07/0000 12:12</p> <p>Record Created:</p> <p>11/07/0000 11:48</p> <p>Date locked:</p> <p>01/01/0000 00:00</p>	
Comments	
<p>Name removed (Educational Supervisor) [21/08/0000 21:07]</p> <p>good reflective log entry</p>	

12 APPENDIX 4: SAMPLE OF ARTEFACT

Sepsis Screening

1. Vascular access ?

	Yes	No
type		
date placed		
site		
local finding		
blood culture finding		

Suspicion of:
line infection?
Yes No

2. Clinical pulmonary infection score (CPIS)

Variable	points	score
temperature (°C)		
36.5 – 38.4	0	
38.5 – 38.9	1	
>39.0 or <36.0	2	
blood leukocyte count (# per mm ³)		
4,000 – 11,000	0	
<4,000 or >11,000	1	
tracheal secretions		
small	0	
moderate	1	
large	2	
purulent (add 1 point if purulent)	+1	
oxygenation (PaO ₂ /FiO ₂)		
≥240 or presence of ARDS	0	
<240 and absence of ARDS	2	
chest radiograph		
no infiltrate	0	
patchy or diffuse infiltrate	1	
localized infiltrate	2	

Intubated /
mech vent
support?
Yes No
date intubated:

pneumonia?
Yes No

3. Abdomen

	Yes	No
recent abdominal surgery?		
abdominal pain?		
abdominal distention?		
purulent drainage from surgical drains?		
intolerance to enteral nutrition?		

abdominal
infection?
Yes No

4. Skin / soft tissue

	Yes	No
erythema / drainage from other surgical site?		
site		

cellulitis / soft
tissue infection?
Yes No

5. Urinary tract

	Yes	No
urinary catheter?		
date placed		
latest urinalysis / urine culture results		

UTI?
Yes No

6. Other site

	Yes	No
site		

other infection?
Yes No

Completed by: _____ Date / time: _____